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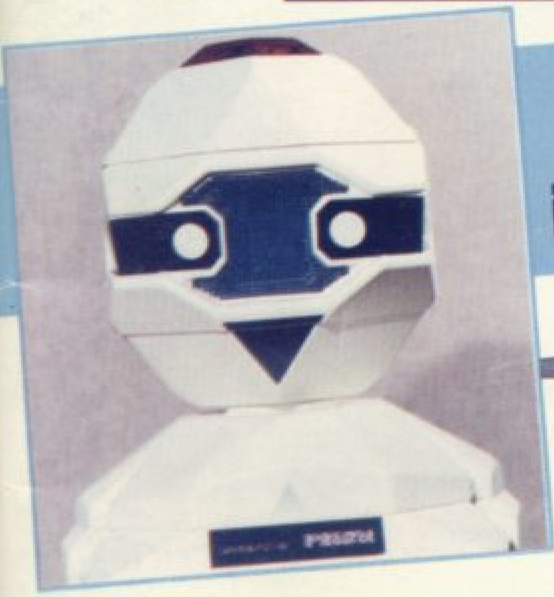
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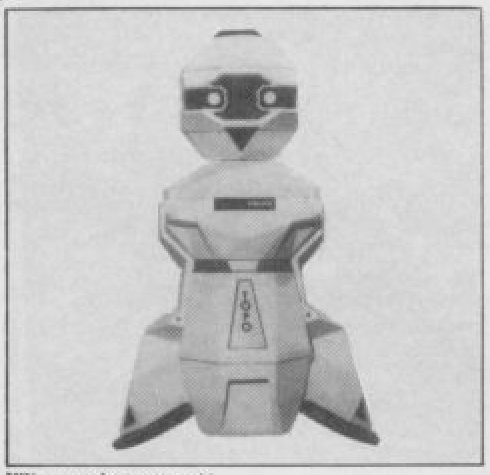
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WITH HIS LATEST ALBUM, The Bop Won't Stop, pop idol Shakin' Stevens adds his name to those other rock stars whose records carry additional computer program tracks. Pete Shelley, Chris Sievey and Mainframe are among those musicians who have used the computer boom to improve record sales, although so far that gimmick does not appear to have had the desired affect.

Putting aside the rather dubious advantages of using hi-tech to sell hard rock, the practice does serve to underline the growing bond between the music scene and the software scene, a bond which indicates the similarity between the two industries.

Rock and roll has always preached the rags to riches myth — the garage band which becomes an overnight sensation, signing fat contracts and shooting straight to the top of the



charts with a bullet. The truth was somewhat different, and bands often spent gruelling years on the road to success, waiting for the big break which never came.

The software games industry, being relatively new, can still hold out the carrot of overnight success and untold wealth. It is not so long ago, after all, that software publishing was itself a cottage industry, and companies with household names today were previously only to be found hidden among the classified advertisements. Young up-and-coming programmers are still being discovered by talent-spotting publishers and the contracts can involve ludicrous amounts of money.

The times they are a-changing, however, and it is becoming as difficult to break into the software market as it is to get a recording contract. Software houses are endeavouring to promote the programmers as well as the programs, and consequently would-be games writers must be exceptional to be accepted. No longer anonymous boffins, those whizz-kids might soon be elevated to the status of superstars, and punters could be asking at their local micro shop for the latest game by Mike Roman rather than the recent releases from the Martian Software stable. We at *Sinclair User* have always emphasized the human factor in computing, and our Hit Squad series



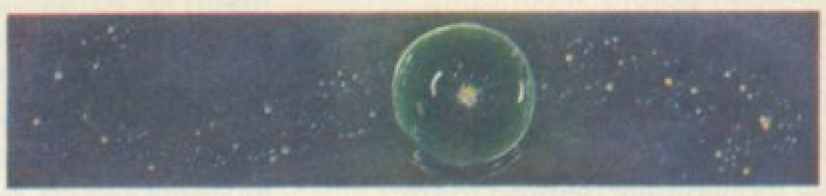
introduces the brains behind the best-selling games. Neither books nor discs are sold on the strength of the publishers' name but on that of the author or musician, and many believe that software should be no different.

Instant success, Top Ten charts, lavish publicity and the cult of personality — all those the games industry has in common with the pop world, and it is worth remarking that it is in those companies with experience in the music industry, such as Virgin Games and K-Tel, where such factors are most apparent. It could also be argued that software games have the same transitory appeal as pop singles; this year's model quickly becomes last year's thing. Zapping aliens and maze man games will be golden oldies, played only by ageing micro freaks. The kids will have moved on to something else.

Bootleg blues

ILLEGAL RECORDINGS — bootlegs — have long been the bane of the record industry. Even before rock and roll arrived jazz fans were paying high prices for illicit recordings of Charlie Parker. Breaking almost every copyright law, bootlegs have nevertheless continued to enjoy a healthy existence, despite legislation and tighter security at studios and concerts, and despite their often inferior quality and exorbitant prices.

Now, inevitably, bootlegging has come to the games industry, and software houses across the land are up in arms and preparing to man the barricades. Apparently colossal amounts of money are being lost to the dastardly pirates, and some of the smaller publishers have their backs to the wall. Whether



the pirates are members of the Dunzappin Computer Club or Foster-swilling Antipodeans, the combined might of the software publishers will give no quarter. The thought of all that lost revenue has been too much to bear.

It is extemely unlikely, however, that they will succeed where the long established record companies have failed, and though they might be able to frighten a few school-children, overseas the organized pirates will probably continue to flourish, at least until the software houses have the export market sewn up.

In the meantime, the games industry is fighting to retain its legitimate hold over its products, lobbying M.P.s and publicising its cause. Technology might be introduced to prevent copying, of course, though that has been attempted before by record manufacturers. The truth is, that as long as cassette-players can record as well as play back, copying will continue, and perhaps the publishers and programmers of games which have been pirated will think twice when they next record one of their Barry Manilow albums for a friend. Illegal copying is not, after all, confined to the software industry alone.

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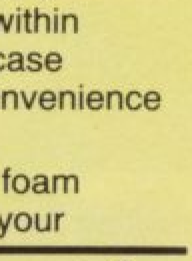
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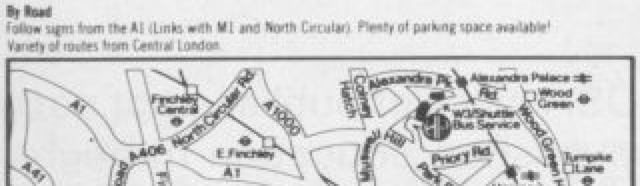
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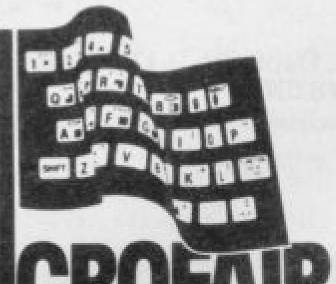
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The Stonechip expandable RAM pack has a buffer at the back so that you can add extra RAM if you need it.

The software offer features games for both the ZX-81 and Spectrum. In the front-line is J. K. Greye with its famous series of games tapes for the 1K and 16K ZX-81.

The offers from this company also include two games for the 16K or 48K Spectrum. 3D Vortex takes place in a swirling space abyss. Arcadian includes four games, including a version of space invaders.

Two other major software houses are offering famous products. Legend produces its first release Valhalla, which is already being hailed as the new Hobbit and Psion is offering Scrabble, a faithful version of the board game.

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Solving a question of precision

A WHILE AGO one of our members called the club helpline with a software problem. He was comparing 2 numbers in an IF statement, but although they should have been equal, the comparison was not correct. It transpired that one of the numbers was a constant while the other was an expression. The expression should have evaluated to exactly the same value as the constant. The member was not a beginner, and had tried the normal debugging procedures. When he PRINTed the numbers they both looked exactly the same on the screen, yet the comparison failed.

Sinclair Basic holds numbers in binary floating point format—most other versions of the Basic do too. Not all decimal numbers can be exactly represented. In the case in question, one such number was repetitively added to itself until the minute discrepancy between the decimal and binary representations had a cumulative effect. The binary version was not exactly the same as it would have been had the decimal numbers been added the same number of times and then converted to binary.

The reason why the numbers looked the same when PRINTed is quite straightforward. Numbers are held in memory to a greater degree of precision than that to which they are PRINTed, for the very reason outlined above.

Let us assume you are comparing A and B. If you are experiencing the same problem, then instead of using IF A = B THEN...." use IF ABS(A-B) < >0001 THEN...." With this method you can set the degree of acceptable accuracy yourself.

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Basildon: Roundacre Microcomputer Users' Club. J Hazell, Basildon 285119/416333. Meetings every Wednesday 7.30 to 10.30pm.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Crewe and Nantwich Computer Users' Club: J E A Symondson, 46 London Road, Stapeley, Nantwich, Cheshire CW5 7JL.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh: Edinburgh Home Computing Club. John Palmer (031 661 3183) or Iain Robertson (031 441 2361).

EZUG-Educational ZX-80–81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80–81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX Club: Meetings every Wednesday 7pm at Youth Activities Centre. Belmont Road, Liverpool 6. Details from Keith Archer, 031-236 6109 (daytime).

Manchester Sinclair Users' Club: Meets every Wednesday, 7.30pm, at Longsight Library, 519 Stockport Road, Longsight — 061-225 6997 or 061 445 6316.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80–81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Nottingham ZX Spectrum Club: Would like to hear from new members. D Beattie and P Riley, 53 Kingsley Crescent, Sawley, Long Eaton, Nottingham NG10 3DA.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Roche Computer Club: 8 Victoria Road, Coop Rooms, Roche, Cornwall: 0726 890473.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: South Yorkshire Personal Computing Group. Enquiries to R Alderton (0742 20571), S Gray (0742 351440), P Sanderson (0742 351895).

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

St Albans: Bi-monthly meetings and a magazine. Details from Adam Slater, 40 Watford Road, St Albans, Herts AL1 2HA. Telephone: 0727 54176.

Stratford-on-Avon Computer Club: Meets on the second Wednesday of every month. Telephone: 0789 68080 for details.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

West Sussex: Midhurst and District Computer User Group. Enquiries to V Weston (073 081 3876), R Armes (073 081 3279).

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Austria: ZX User Club, Thomas Christian, c/o Wissenschaft Forscht e. V., Postfach 141, A1190 Vienna. Meets every first Friday of the month. Telephone 0222-44 32 050 for details.

Belgium, France and Luxembourg: Club Micro-Europe, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (32/2/6537468).

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX Club, a postal club; contact Aribert Deckers, Postfach 967, D-7000 Stuttgart 1, West Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Irish Sinclair Users Club: PO Box 1238, Dublin 1. Publishes a newsletter. Send SAE for details.

Italy: Sinclair Club, Via Molino Vecchio 10/F, 40026 Imola, Italy.

Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80–81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

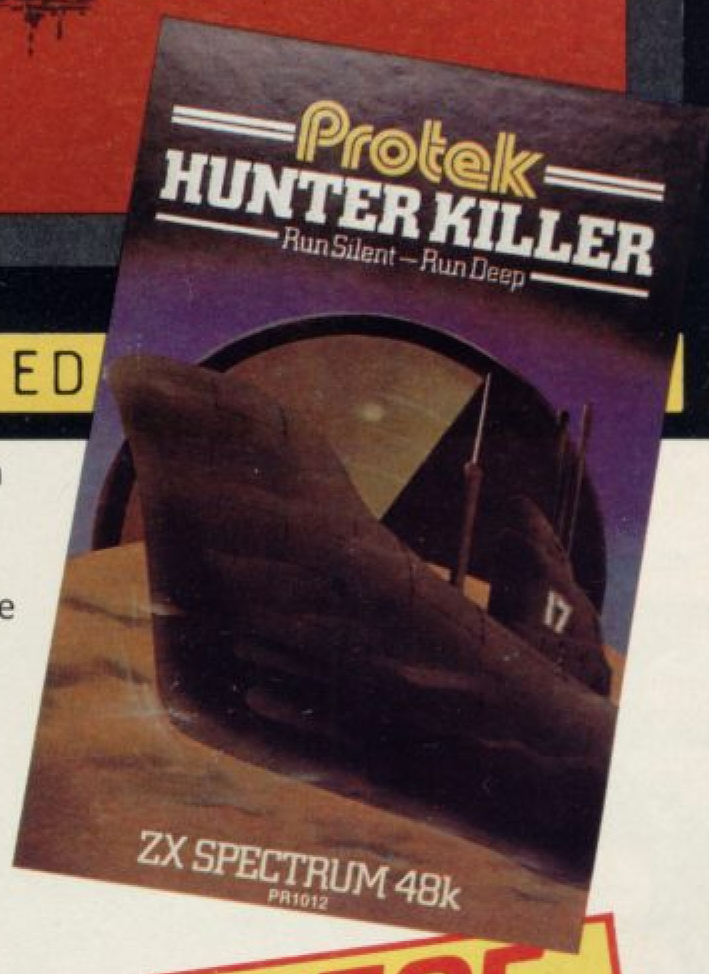
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede, Sweden.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

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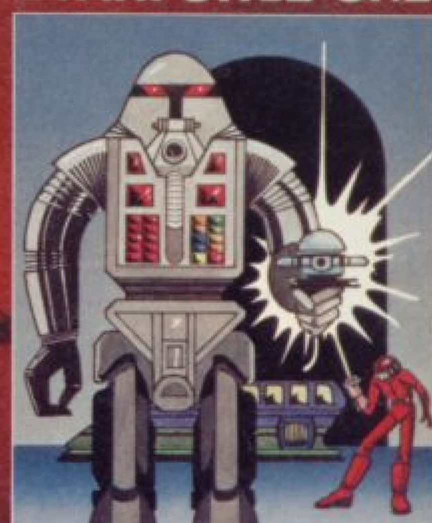


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"The whole game mechanism makes for a very Addictive Program, and one that remains a firm favourite with many Adventurers."
Popular Computing Weekly, June 1983.

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THE DEVIL RIDES IN

I uttered the last incantations as the clock struck thirteen. All fell silent except for a faint rustling in the corner. From out of the shadows they came, all Hell's fury against me but I was not defenseless until the Angel of Death, astride a winged horse, joined the battle. Avoiding his bolts of hell fire, I took careful aim. My chances were slim, but my luck held . . . .

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Available from Feb '84

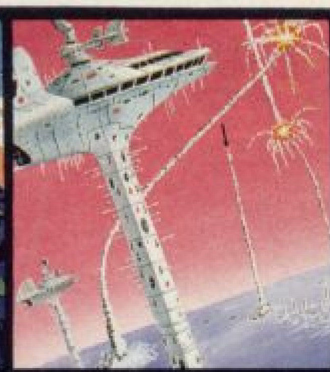
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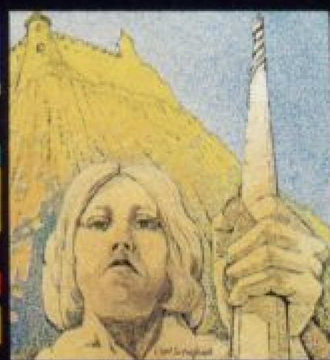
Nanas
Catch the bananas, miss the coconuts. Easy? Try it and see. Simple in concept, hilariously entertaining – it'll drive you bananas.
16K Spectrum. £5.95



Timequest
A warp-space accident spreads your capsule across time. As you land in each new era, fresh perils face you. A very skillful graphic adventure
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One Hundred & Eighty
That famous shout tells you what it's all about! A good implementation of a difficult game – doubles, trebles, twenty-five and bull all possible.
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A quest to find the long lost Staff of Health. Is it in one of the castles? Or in the Tower? There are plenty of problems – and plenty of opponents – in this great graphic adventure.
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An authentic version of one of the most addictive arcade games devised. All the usual features (Centipede, Spider, Bug, etc) with full use of Spectrum graphics and sound.
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Great sequel to the best-selling Mad Martha. Hilarious graphic adventure, with hero Henry in sunny Spain, beset by wacky waiters, mad bulls and the wrathful Martha.
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Drakmaze
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Laserwarp
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48K Spectrum. £6.95



Knockout
No aliens, lasers, invaders or rockets – just simple but absorbing fun which up to 4 players can enjoy.
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Professional test for air controller

HEATHROW Air Traffic Control, a 16K Spectrum simulation game from Hewson Consultants, was assessed by a professional air traffic controller on the Central Television *Magic Micro Mission* recently and passed the test with flying colours.

In the programme David Gunson from Birmingham airport and Stephen Martin, the programme's regular software tester, gave the simulation a score of four out of five for entertainment value.

Presented by Jo Wheeler, *Magic Micro Mission* is a new production featuring a spaceship sent to explore the new boundaries of computer knowledge. It is screened in the Central Television, Ulster TVS, Border Television, Tyne Tees and Television South West areas.

Manic Minor seeks new horizons

THE BUG-BYTE best-selling program **Manic Miner** is appearing under a different label.

Matthew Smith, the 17-year-old-author, has left his old firm to join Software Projects, a new company. Smith will become a director of the company when he comes of age.

Besides Manic Miner, Software Projects will be marketing its sequel, **Jet Set Willy,** as well as several other new games.

Bug-Byte, which held a licence to produce Manic Miner but not the copyright, says it is not too hard-hit by Smith's decision to move. "It is still an excellent game and we have 50,000 copies of it left," says Bug-Byte director Tony Baden. "We wish it the best of luck under any label."

Surprise launch of new Sinclair computer

THE NEW business machine from Sinclair Research, which has been code-named the ZX-83, was launched in January. The machine has twin Microdrives for fast access to mass storage and a typewriter-style keyboard. It does not have the flat-screen television many people were expecting and, as a result, is not as portable as was first thought.

The microprocessor chip at the heart of the new computer has been specially-designed to Sinclair requirements and is being manufactured by American electronics company Motorola.

The incorporation of Microdrives with the machine instead of the more usual disc drives means that the price can be substantially lower than computers such as the Apple II, which costs thousands of pounds. The cost of the Sinclair is as little as £400.

With the expansion of its range into the business market, Sinclair will have to think about peripheral support, such as printers and light pens. That means the design of a new printer, as the ZX printer will not suffice for the business community.

The Microdrives may also prove disappointing to many business owners. Despite the low cost of the machine the Microdrive, in comparison with disc, is slow. Potential purchasers may choose a more expensive disc-based machine. The new machine is, however, a great step forward in the business computer market.

Interface Two cartridges have arrived

THE SPECTRUM Interface Two has arrived in the stores and the software for the new ROM-based peripheral has started to flow.

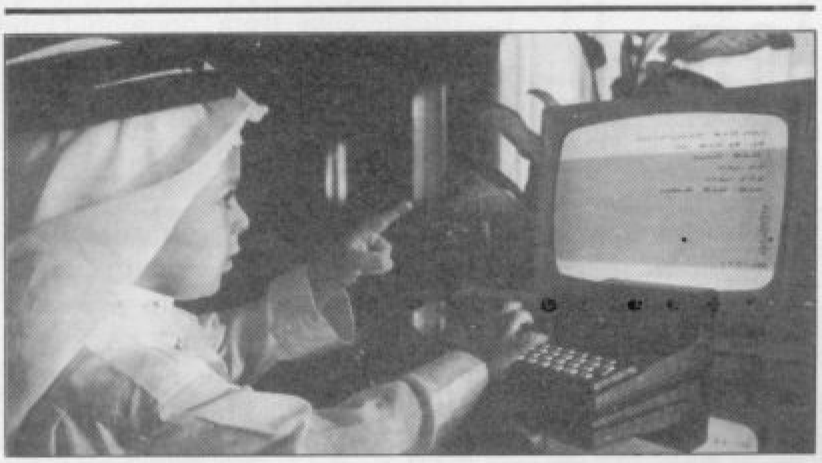
When the ROM board was launched the only cartridges available were Planetoids, Space Raiders and Backgammon, which had previously been sold on cassette in the Sinclair Research software library. The new range of software, including packages which had originally been produced by Ultimate Play the Game, did not arrive until several months later. The games included Jetpac, Cookie and Tranz Am.

The Interface is being sold in W H Smith, and Boots has also placed a large order.

Future plans for the interface have not been fixed but the company is considering putting utility packages and languages onto ROM. A spokesman says:

"We have not decided what we shall do. It is hoped, however, that the Micro-Prolog language will at some stage be put onto ROM."

Interface Two seems to be the last of the planned peripherals which Sinclair Research is to add to the Spectrum, as it is dead-ended and will take only the ZX printer. It is, however, possible that other peripherals could be added between Interfaces One and Two.



Arab-speaking home computer enthusiasts, who have long dreamed of being able to program in their own language, are happy at last. Ramez Alhalaby, president of Autoram Computers in Jeddah, Saudi Arabia, has developed an Arabic version of the ZX-81 — a major breakthrough in the Arab world, where until now only large business systems have been programmed in Arabic. Micro owners have had to use English previously and the new version of the ZX-81 is expected to give Sinclair sales in the Middle East a considerable boost.

Car game on pop cassette

FANS of Shakin' Stevens who buy his latest album, *The Bop Won't Stop,* on cassette can enjoy the bonus of a specially-commissioned game for the 48K Spectrum.

Written by Olympic Software, the game entails driving a car into Shaky's 'ole house' while avoiding lethal vampire bats. A huge score will get the player into Shaky's top ten.

CBS Records, which produces the cassette, says that the game was designed for the Spectrum rather than any other micro because it has become the most popular home computer in the U.K.

Software houses fight piracy

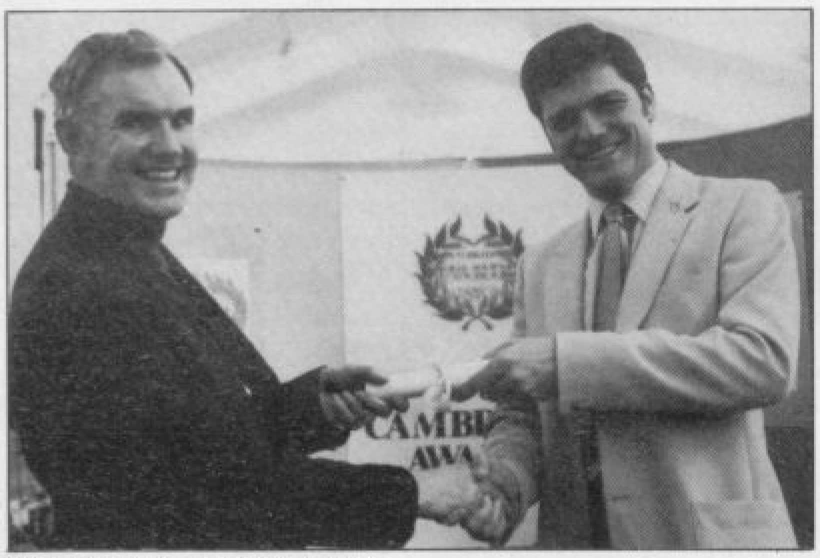
WITH SOFTWARE PIRACY causing an estimated loss in sales of at least £100 million, British software houses have started to fight back.

Quicksilva is leading the way by pointing the finger at various overseas operations which are marketing illegal software. One such outfit, claims Quicksilva vice-chairman Rod Cousens, is an Australian company called Rocksoft, which has been distributing bootlegged copies of Psion, Bug-Byte, Quicksilva and Melbourne House games.

Melbourne House is itself investigating piracy in Australia and is taking legal action. Alfred Milgrom, chairman, said; "It would be imprudent for us to make any specific comments on any individual company before court proceedings have been taken. However, be assured that we have a very aggressive attitude towards pirating and we do not hesitate to take action whenever we find that any of our rights have been violated."

Another major publisher, But-Byte, is tackling the problem nearer home, by attempting to discourage the ever-increasing copying of tapes by schools and computer clubs. Having received reports that pupils in one school are recording software with the co-operation of the staff, But-Byte has contacted the County Council concerned threatening legal action unless the practice is stopped.

The Guild of Software Houses is looking into the problem of piracy. Nick Alexander, chairman of the Guild and managing director of Virgin Games, said, "It is generally regarded that between one and ten pirate copies are made for each game sold." He believes that the continuation of piracy could result in the bankruptcy of software companies.



Melvin Lloyd-Jones and Mark Lucas.

Cambridge Award presentation

At the 1983 Cambridge Award prize-giving, held at the ZX Microfair in December, Mark Lucas, right, was presented with the first prize of £1,000 by Melvin Lloyd-Jones, director of Cases Computer Simulations. Mark, whose Spectrum wargame Battle 1917 was declared the overall winner, also received the Cambridge Award trophy, pictured below.



The Cambridge Award is co-sponsored by the software house Cases Computer Simulations and *Sinclair User,* and is intended to encourage the development of intellectually stimulating games programs written for the Sinclair computers. Details of the 1984 competition will be announced soon.

Radio waves can interfere

RADIO WAVES and interference from household appliances can affect the normal operation of home computers, according to the television programme *Tomorrow's World.*

In many countries laws govern the ways in which computers must be protected from interference. A silver-coloured paint is put round the inside of computer cases.

Computers in Britain, however, have no such protection. A spokesman for Sinclair Research says: "We do not use this type of protection as there is nothing in the law which states that we have to do so."

Invasion of the computer stores is nation-wide

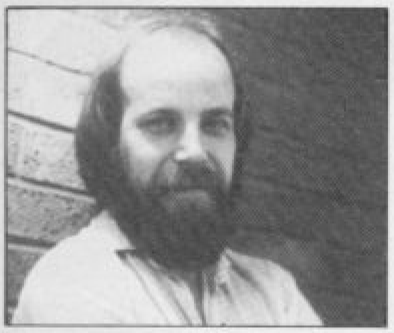
THE FIRST of a new chain of shops specialising in micro software has opened at Chalfont St Peter, Buckinghamshire. Soft Shop will stock more than 1,200 programs for all the leading home computers, including the ZX-81, Spectrum, BBC, Commodore 64 and Oric.

Reflecting the preponderance of Spectrum software on the market, more than 350 of the tapes are for that machine. Most are games but there are also educational and business tapes. "We predict that the demand for Spectrum educational software in particular will grow considerably," says managing director Stuart Kotchie.

The shop will also sell computer accessories, such as blank tapes, leads and joysticks. A second shop is soon to open in St Albans and another 20 outlets throughout the Home Counties are planned.

Prism Software Products has signed an agreement with Greens of Debenhams to sell software at 70 nation-wide branches of the department store chain. Three of the stores will stock more than 1,000 titles, as well as books, magazines and peripherals.

W H Smith has expanded its computer operations by opening 23 new computer shops, bringing the total throughout the country to 30. The first three shops at W H Smith branches were opened in July, 1983 and four more followed three months later. All allow customers to try complete computer systems, including the Spectrum and ZX-81, the Acorn, BBC and Electron, the Apple IIe, the Commodore 64 and the Oric. Computer sales are backed by a wide range of software, books and magazines.



John Lambert, our new hardware reviewer.

JOHN LAMBERT has joined the editorial team at Sinclair User, taking over the Hardware World section from Stephen Adams.

He has extensive experience in the hardware field, having worked for a large add-on company. "I come from a family background of electronics and it therefore seems natural that I should end up in computers. More importantly I am a user and my reviews will hopefully reflect this. I will be looking not only at the design of the hardware but also if it represents value for money, an important consideration these days."

Floppy discs challenge the Microdrive

COMPETITION for the Sinclair Microdrive has arrived in the form of the first floppy disc drive and interface package for the Spectrum

The Viscount disc drive and interface is manufactured by Interactive Instruments and sold at £245 by the Spectrum computer chain. It has a capacity of 100K on a 3¼in. floppy disc.

Another company which has promised a floppy disc drive for the Spectrum is ITL Kathmill Ltd. The Byte Drive 500 has already been launched for the Oric One and the Spectrum version has been promised for late April or the beginning of May.

It is based on the Hitachi drive and costs £260. It is supported by a toolkit assembler and text editor and is aimed mainly at the business sector of the market.

The floppy discs are single-sided with a total capacity of 440K. Approximate file access time has been put at three microseconds.

John Melville, a director of ITL, says: "I am aware of delays in the Sinclair market and we will not be launching the drive until we have sufficient stocks available."

A spokesman for Sinclair Research played down the idea that disc drives would have any impact on sales of the Microdrive. "We will not start worrying unless those companies can reduce the prices of the drives. It is probably not feasible to compete with the Microdrive on this level."

Further information on the Byte Drive 500 can be obtained from ITL Kathmill Ltd, The Old Courthouse, New Road, Chatham, Kent ME4 4QJ.

Spectrum Top Ten

	Program	Last month	Company	Memory
1	Atic Atac	–	Ultimate	48K
2	Lunar Jetman	2	Ultimate	48K
3	Ant Attack	5	Quicksilva	48K
4	Jet Pac	–	Ultimate	16K
5	Pyramid	–	Fantasy	48K
6	Kong	3	Ocean	16K
7	Death Chase	–	Micromega	48K
8	Chequered Flag	–	Psion	48K
9	Manic Miner	–	Bug-Byte	48K
10	Pool	6	CDS	16K



CONGRATULATIONS!

MARK LUCAS

Winner of the 1983
Cambridge Award
a highly original
WAR GAME

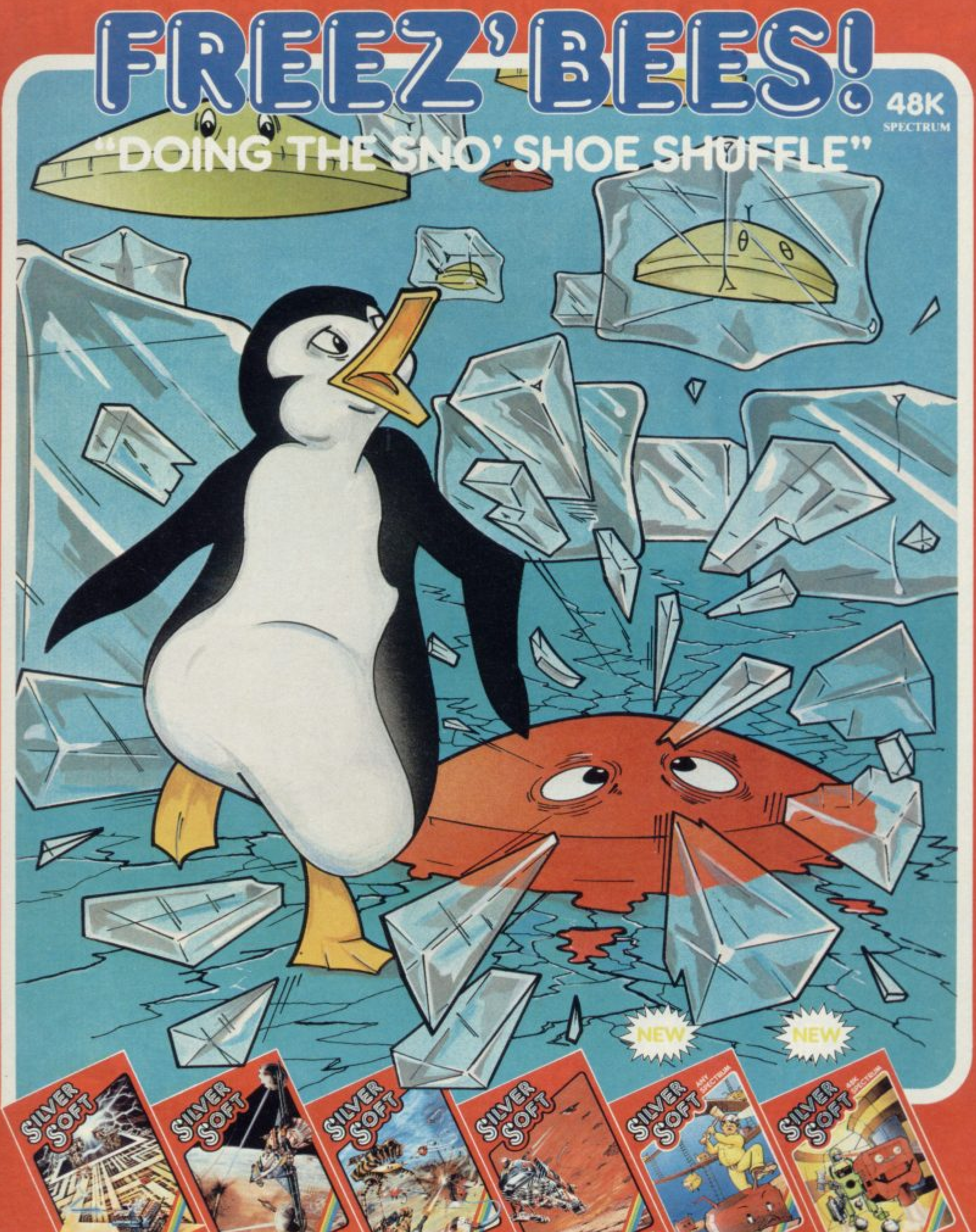
BATTLE 1917



The game is played by two players on a board 21×32 showing a map which changes with every game. Each player has 29 pieces including infantry, cavalry, tanks, artillery and a King. The object of the game, like chess, is to kill the enemy King. The game will appeal equally to all ages and all skills. This is the computer age's answer to Chess. Available from all good computer shops at £6.

Cambridge Award

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DERBY DAY for the 48K Spectrum **Only £5.95**
Gambling on any horse in the field, up to 5 players can lay bets with Honest Clive Spectrum the bookmaker. Watch the race begin as the tape lifts and marvel at the amazingly realistic 3D animation as the riders jockey for position. See the slow motion finish. Sound and colour used to its fullest in this 44K of superb programming. Not recommended for compulsive gamblers.

CAVEMAN for any ZX Spectrum **Only £4.95**
Enter the prehistoric world and discover the difficulties our forefathers had in obtaining food. The idea of the game is to pick your way across monster infested plains, and through treacherous mountain ranges to reach the Pterodactyl's lair.

STARGAZER SECRETS for the 48K Spectrum **Only £5.95**

The only serious Astrological forecaster produced for the 48K ZX Spectrum. Written by a professional Astrologer, it condenses Astrology's complex mathematics and relations into an easy to use program. By entering the subject's name and date, time and place of birth, the program quickly interprets the data, plots a Natal Chart and lists the results under a number of categories. A program that combines the newest art with the oldest Science.







CRAWLER for any ZX Spectrum **Only £4.95**
An addictive chase game needing both reaction and strategy. In fast machine code for arcade action.
You are Crawler and your aim in life is to hunt down and devour as many bugs as you can. Every time you catch one you grow longer, so that you soon have to avoid biting yourself! The more bugs you eat, the more difficult it becomes. You can choose between 9 skill levels.

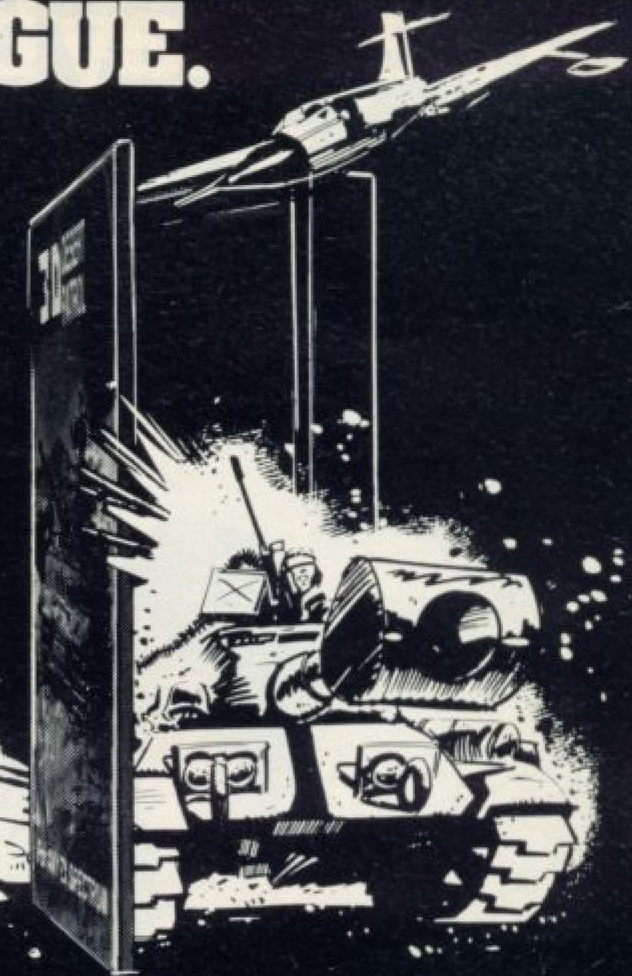
JACKPOT for the 48K Spectrum **Only £4.95**
A complete simulation of a popular fruit machine, using definable graphics to the fullest. It contains a complete introduction to the rules of its HOLD, NUDGE, GAMBLE and FEATURE BOX with animated demo. Memory mapped reels, simultaneous revolution, staggered stop, animated bet and payout, payout board and realistic sound effects recreate the original. A must and a wallet saver for any fruit machine buff.

TEST MATCH for the 48K Spectrum **Only £5.95**
This is the No. 1 hit of the Summer and is a 3-D Test Match Cricket Simulation. Contains two programs – the first a full 5-day Test, the second a selection of one day matches. Each program contains a full scoreboard and definable teams. The game already contains England and Australia teams.

EXCITEMENT AND INTRIGUE.







RESCUE for the 48K Spectrum **Only £5.95**
An adventure game that needs a Special Program to detail its Rules! VERY simply, you must find the Map and Radio Men, plot your route and monitor patrols as they scour the 40+ locations you are travelling through. If you have the right equipment you can cross into Secret Territory in search of the Castle containing the imprisoned Princess. If you find the Princess, you must still return to base with her.

LUNAR RESCUE for any ZX Spectrum **Only £4.95**
A fast moving addictive program. In this game you are the pilot of a spaceship with orders to rescue stranded Astronauts from the Moon's ragged surface. Six astronauts are relying on you to save them, but you can only take one at a time. You will have to steer your craft through treacherous asteroid belts surrounding the moon.

3-D DESERT PATROL for any ZX Spectrum **Only £4.95**
A game of Strategy and reaction in 3 dimensions. You are the commander of a heavily armoured tank rumbling towards safety. You must avoid mines and enemy tanks. Your colour coded mine indicator will aid you across the dangerous enemy fields. Once across, you are vulnerable to enemy attack with only 50 shells available for retaliation.



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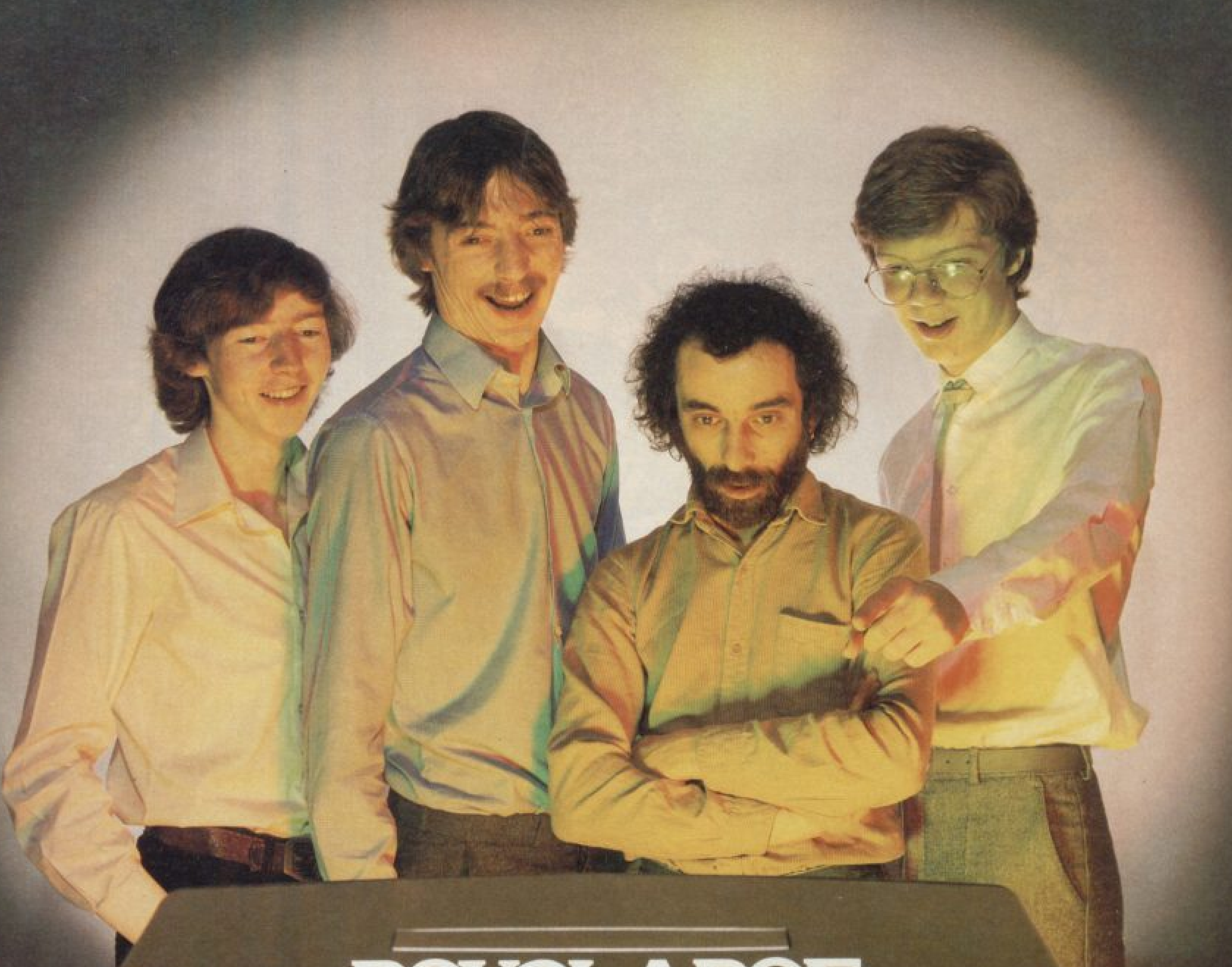
HANDICAP GOLF for the Dragon 32 **Only £6.95**
An 18 hole, 1 or 2 player handicap game. There are Bunkers, the Rough, Lakes, Trees, gorse bushes and gusting wind which all have to be taken into account as you choose the strength and direction of your shot. The Computer decides the length of the hole and its par, making sure that you never, EVER play the same hole twice. Watch the Dragon 32 build up the hole in a fascinating graphics routine. Full use of sound and colour.

HANDICAP GOLF for any 48K Spectrum **Only £5.95**
Amazing, 3-D graphics on a memory mapped course, this program has over 250 user definable graphics to produce a startlingly realistic simulation. You have a selection of 15 clubs and a caddy. Each green is automatically enlarged when putting commences. The graphics have to be seen to be believed. You'll wish you had a swing as good as the cartoon golfers. There's even a 19th hole.

CRL

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PSYCLAPSE COMMODORE 64
& BANDERSNATCH. 48K SPECTRUM

How will these four master computer game writers be feeling in a few weeks time?

They have been brought together to pool their awesome talents to create the two most sensational, mind boggling games ever imagined...**Psyclapse and Bandersnatch.**

When such computer wizards as (from left to right) Ian Weatherburn, Mike Glover, John Gibson and Eugene Evans are locked away for weeks on end, anything can happen, will they maintain their sanity, or whats more to the point can you control your patience?

Imagine ..the name of the game

Coming soon from Imagine...Psyclapse and Bandersnatch... the two most exhilarating experiences ever. Can you wait?

Imagine Software Limited, 5 Sir Thomas Street, Liverpool, Merseyside L1 6BW.
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Gilbert factor under fire

MY SUGGESTION for the improvement of the Software Directory is to employ John Gilbert full-time, since of 207 items only 75 have been "Gilberted". Of 27 educational cassettes none has been assessed — surely a gross omission — and of 14 business only five have been tested.

Ian Fletcher,
Freshwater, IoW.

● *John Gilbert assures readers that he works full-time for* Sinclair User, *but points out that he would need to be employed 24 hours a day to review everything he receives. He will endeavour, however, to assess as many packages as possible. All educational and business software will be given Gilbert Factors eventually.*

TV cabinet is deceptive

I WOULD like to warn fellow readers. I have owned a 48K Spectrum for six months and found it an excellent machine. Recently I changed my TV set, selecting a 16in. Electra colour portable. I was particularly careful in avoiding some Japanese sets.

I found, however, that after about two to two-and-a-half hours' use I lose all colour. On investigation I have found that the Electra case contains a Hitachi set which is not compatible with the Spectrum.

Any Spectrum owner planning to buy a new TV would be well-advised to check the make, as well as the name on the cabinet.

G F Knight,
Newport, IoW.

Bridge needs improvements

I BOUGHT a copy of Bridge Player from CP Software as advertised in your magazine. While the bridge is not too bad, I was disappointed with the juvenile games-type approach to the presentation of the program.

May I make a few points to CP and to other programmers who may see bridge as an area worth exploitation? Bridge is, in general, a game which is taken seriously by numerate, logical adults of at least average intelligence who are usually addicted to the game. I mention that because unless one knows the players one cannot cater for their needs. I would suggest that their needs do not include flashy Horizon-type titles; games-type jingles when a game is won or lost; arcade-type flashing scores at £1 a point — and a jingle when a rubber is won; a message to the player that he has missed his chance when passing on an unbiddable hand — very annoying; ridiculous bids from the computer, particularly when looking for a slam.

The display of the hands, the bidding, the table and information are adequate and it is easy to play the cards, but may I suggest that attention be given to removing the arcade flash and using the capacity released to improve the game, particularly the computer bidding, and to speed the shuffle and deal?

J W Evans,
Southampton.

Amazing new command

MAY I congratulate you on the creation of an amazing new command for the ZX-81. It is " SLAVE ". If you look in issue number 20, November 1983 on page 26 under the heading Speeding Command, you will see what I mean. Also, I was pleased to see that you have increased the size of your magazine to 164 pages. Unfortunately the extra pages seem to be used by more advertisements. Never mind, it is still one of the best Sinclair magazines.

Guy Fullalove,
Meopham, Kent.

● *The 'new command' was, of course, a printing error and should have read SAVE.*

Identifying the tape version

READERS may be interested in a very useful device I have been employing recently in my programming. I use a Spectrum 48K. I always set my auto-run at the same line number. I use 9950, then the usual SAVE " name " LINE 1. I have now added: 9980 PRINT 48000 — (65536-USR 7962) to the end of any complex program on which I am working.

If, like me, readers employ more than one cassette to update their programs, they will find that whenever the program is SAVEd the number of bytes used will be printed at the same time as the 0 OK, 9980: 1 which appears on line 22.

That number added to the cassette clearly identifies which version one is examining. Of course, for the 16K Spectrum, use PRINT 16000.

Charles Buzzard,
Chorleywood,
Herts.

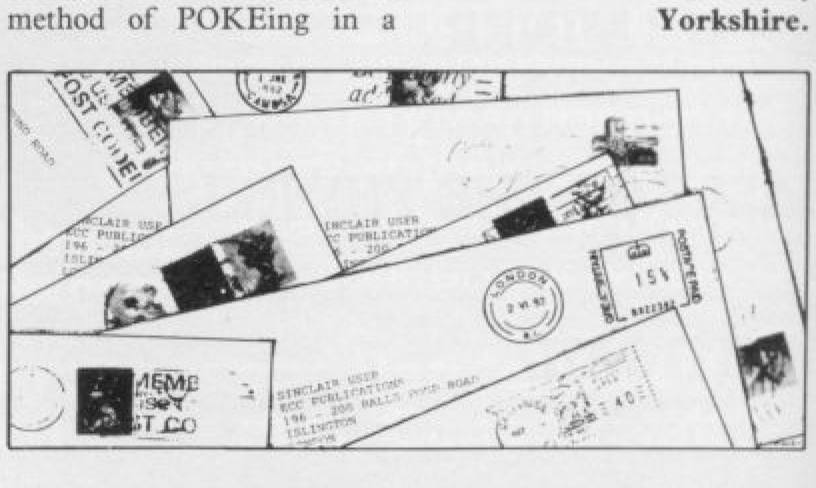
Frustration of Manic Miner

ALMOST two months after purchasing Manic Miner for the 48K Spectrum I completed the 20 lethal caverns. Since then I have achieved a high score of 85,185 which took just over an hour.

Manic Miner can be one of the most frustrating games when you make stupid mistakes, so I have written a method of POKEing in a number to allow you to 'die' without losing any 'men'.

First break the program after loading the basic loader — when the screen turns black — and then type-in 'PAPER 7', followed by 35 POKE 35136,0; and RUN; then re-start the tape.

Simon Scott,
Baildon,
Yorkshire.



Functions not in manual

I WAS INTERESTED in John Armfield's article Display in the November issue and got out my Spectrum to educate myself. I found I could do things with INPUT statements which are not mentioned in the manual nor included in any programs I have entered from magazines.

I was trying to write a user-friendly program to input data and produced the following:

```
10   DIM a (5)
20   FOR i = 1 to 5
30   INPUT "Number";
     INT i; "=" i a (i)
40   NEXT i
```

I wanted to print the subscript number of the array a which was to be input and found that ABS i or VAL STR $ i would also work.

If the functions are omitted, the Spectrum expects two inputs, the first being i. If i is input continually in the range 1 to 4, then the loop will also continue from that i.

Readers may be interested to investigate what other functions and combinations of functions will also work. I expect some can put a USR call to good effect.

Finally, I would just like to say what an excellent machine the Spectrum is. I have had it for six months and can scarcely keep off it. I think there is nothing wrong with the keyboard and the method of keyword entry is a definite boon. I think it is better to play arcade-style games on than both a proper keyboard and joysticks.

Brian Cook,
Rainham, Essex.

Speed routine investigated

HAVING READ Edward Wright's letter concerning the POKE which speeds the operation of commands on the 16K ZX-81, I decided to investigate. Type-in this short machine code routine:

```
1 POKE  18000,33
2 POKE  18001,11
3 POKE  18002,0
4 POKE  18003,57
5 POKE  18004,68
6 POKE  18005,77
7 POKE  18006,201
8 PRINT (USR(18000)—
        16373)/1024; "K"
```

If you run it, you will find that '3K' appears on the screen. Wright's POKE makes 13K of RAM disappear.

John Dyer,
Blackburn,
Lancs.

Human error to blame

I FEEL I must reply to Christopher Watkins' letter in the November issue of *Sinclair User.*

I bought my 16K Spectrum about three months ago and when I first tried to load programs from the manual I could not get them to run properly. After a week of perseverance and re-reading everything in the manuals I began to make progress until I now have a great working relationship with it.

In the beginning it was my human errors causing the bugs — that and my inexperience with the Spectrum.

Although Watkins could have had faulty computers I cannot help wondering whether, like myself, he had not read the Spectrum manual thoroughly in the first place.

G Nunn,
Wisbech, Cambs.

Bugs permit high scores

I AM WRITING to tell you about bugs in two programs, Jet-Pac and Spectres. If on Jet-Pac you manage to reach the fourth screen — the plane-like aliens — and then stand on the middle platform, the aliens will not be able to get to you and when they crash into the platforms you still score points. This bug allows the player to amass an enormous score without getting hit by an alien.

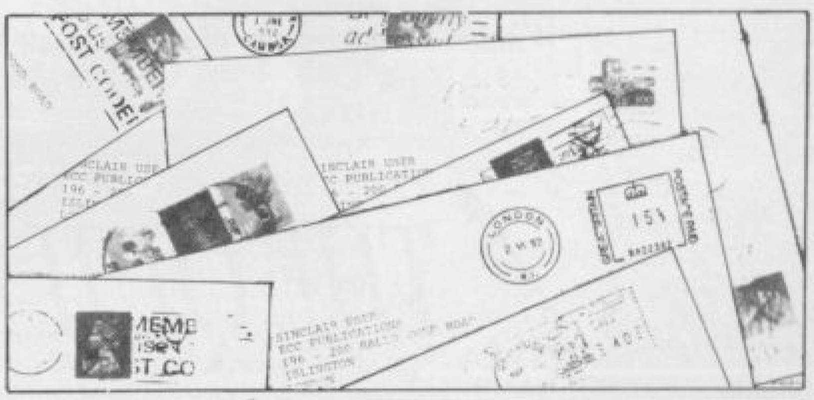
When playing Spectres you get one extra man every 3,000 points but if you reach 12,000 points the space at the top of the screen where the number of the men remaining is usually shown fills up with little dots. When that happens you seem to have an endless number of men. When I reached that point I left the game playing and noticed that every time a ghost got a man and took him to its den, the space where the number of men left is usually shown did not change.

I watched the game play for another 10 minutes but it never ended. This bug allows the player to move round the maze, taking no notice of the ghosts and, like Jet-Pac, to amass a very big score. It is impossible to start a new game without pulling out the power plug and loading the game again.

I think the Mind Games article is very interesting and would be very pleased if Quentin Heath would review Planet of Death by Artic Computing.

Andrew Horsfield,
Rotherham, Yorkshire.

● *Quentin Heath hopes to review Planet of Death in the near future.*



Not just another edition

I AM an old age pensioner and feel I must write to say how incensed I am at being 'conned' out of £1.95. I bought the Second Sinclair User Annual as a surprise for my grandson who has a Spectrum 48K.

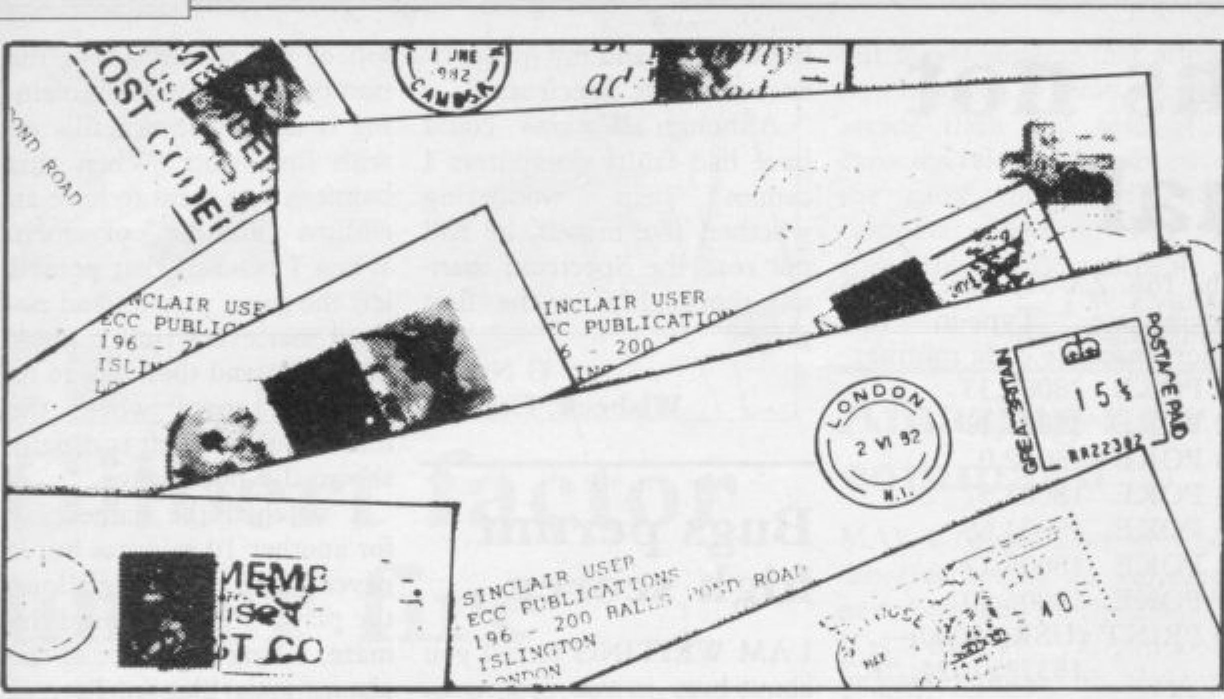
He tells me that it is a summary of the monthly magazines which he has delivered from our newsagent. It would be advisable if, when printing this magazine, you would state that the contents are just another edition of your monthly publications.

B Davies,
Maesteg,
Glamorgan.

● *We are sorry that you feel cheated but we would like to stress that it is more than a rehash of material published previously. The News Section, the Software Review, the Hardware World round-up and the Book Review were all written especially for the Annual. In addition, there are two completely new programs.*

Though compiled with the new reader in mind, the Annual nevertheless is a comprehensive review of the last year and, as such, is a useful and inexpensive addition to any Sinclair user's library.

More letters on page 28.



Too many advertisements

I HAVE only one criticism of your excellent magazine and that is the large amount of advertisements compared to the number of articles. In the November issue there were 107 pages of advertisements and only 57 pages of articles.

I think it unfair to boast that there are "164 fact-filled pages" when the majority are advertisements or space-wasting illustrations. It would be in everyone's interests if each advertisement were shown every two or three months on a rota basis or even if you produced a separate magazine.

Simon Stone,
Leeds.

● *To produce a large colourful monthly magazine with only limited advertising would be extremely difficult and not particularly desirable, as many readers find the advertisements useful and informative.*

As the amount of advertising has increased, so has the amount of editorial matter, which means there is much more editorial content than previously.

Getting rid of an offending screech

WHEN I was reading some of the letters in the September edition I saw one which told one how to get a magenta and blue border with an irritating screech. It also asked if anybody knew how to get rid of offending screech.

I tested it on my Spectrum and found that by typing-in RAND USR 1327 the screech would be eliminated. I also found that if one types-in RAND USR 1234 it produces a yellow and blue border with a noise similar to that of loading a program.

Anthony McKenna,
Stockport,
Cheshire.

SPOT THE DIFFERENCE!

Choosing which game to buy from the mountain available is a difficult job, especially when everyone claims to produce the best on the market. But how can you tell the best from the rest?. To help you decide, read on. . . .

What the real critics say. . . .

Very rarely have software titles produced such universal acclaim as 'Halls of the Things' and 'The Dungeon Master'. Now, with three brand new programs, Crystal continues to set the standard of software excellence. The difference is obvious - the choice is yours:

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THE DUNGEON MASTER

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"I have been a Dungeons and Dragons fan for several years....The package provides excellent entertainment for all fans of the cults and should prove a good introduction to the game". ....Sinclair User.

"Highly recommended for its versality, originality and quality. Definately well worth obtaining". ....ZX Computing.

ZX Spectrum 48K **£7.50**

Written by Graham Stafford.



HALLS OF THE THINGS

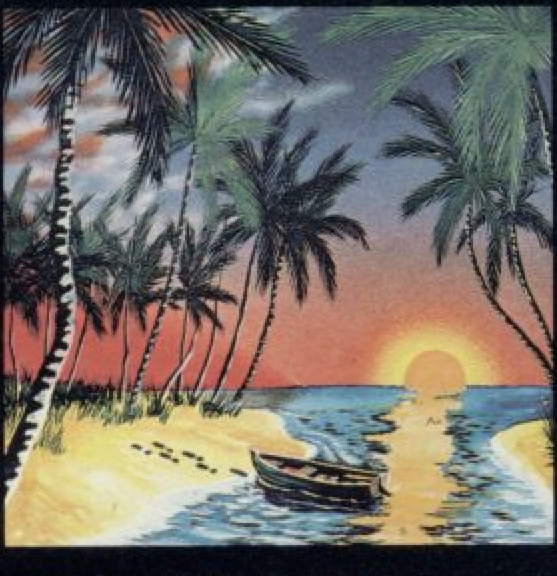
A stunning multi-level maze 'arcade - adventure'.

"Excellent and dangerously addictive - could change the Spectrum games scene overnight". ....Sinclair User.

"Spectacular - One of the best games I've seen, finely balanced between simplicity and addictiveness - superb graphics and colour - I CAN'T RECOMMEND IT HIGHLY ENOUGH". ...Popular Computing Weekly.

ZX Spectrum 48K **£7.50**

Written by Neil Mottershead, Simon Brattel and Martin Horsley.



THE ISLAND

The ultimate test of logic and deduction! Can you solve the hidden mysteries of the South Pacific Island on which you have been stranded - and escape alive! A brilliant classic style adventure game to facinate and frustrate you for months!

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Written by Simon Brattel and Neil Mottershead.



ROMMEL'S REVENGE

A brilliant interpretation of the most visually stunning arcade game of all time. Superb high resolution 3D graphics with full perspective plus a host of new and exciting features make Rommel's Revenge the most spectacular game ever produced for your Spectrum!

ZX Spectrum 48K **£6.50**

Written by Martin Horsley.



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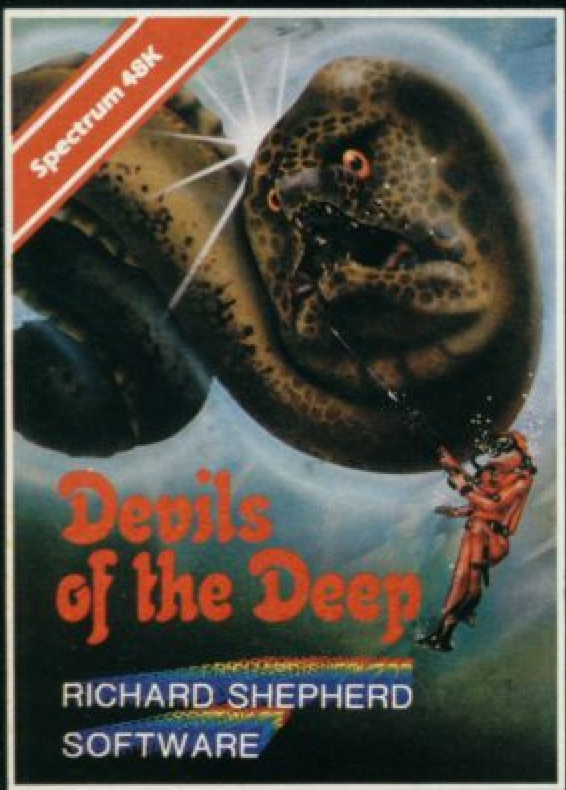
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Rommel's Revenge ☐ The Island ☐
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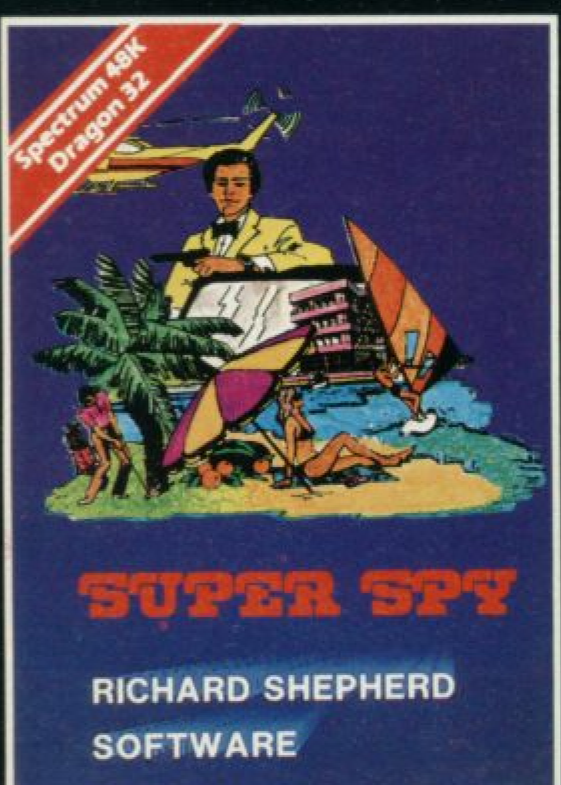
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Devils of the Deep

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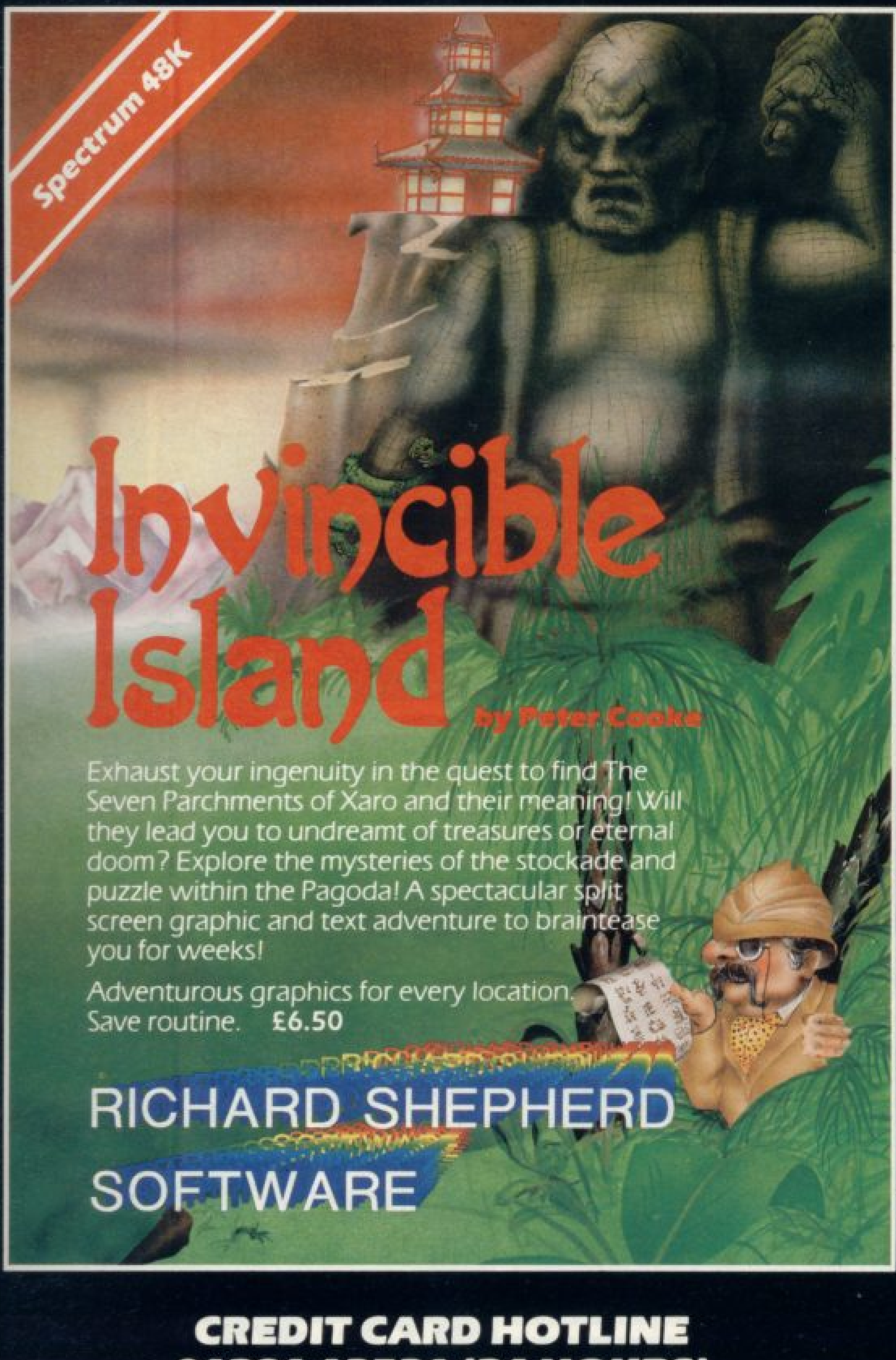
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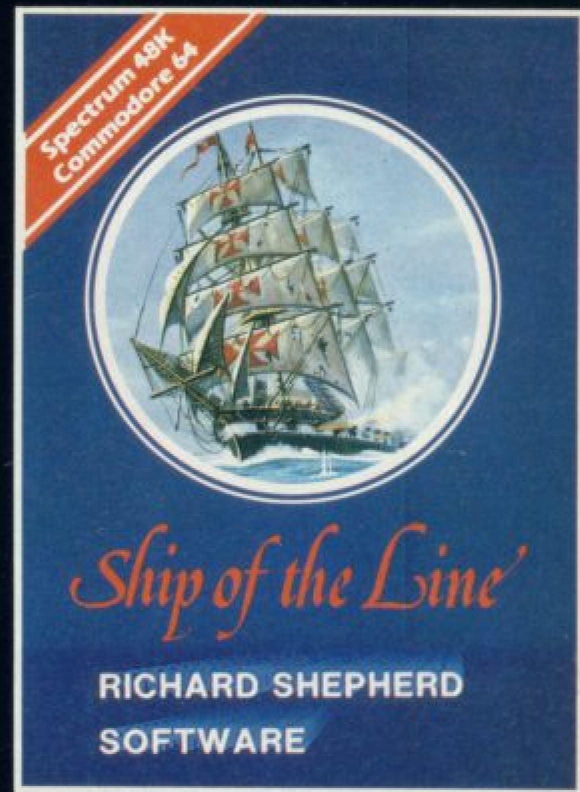
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ELM HOUSE, 23-25 ELMSHOTT LANE, CIPPENHAM, SLOUGH, BERKSHIRE.

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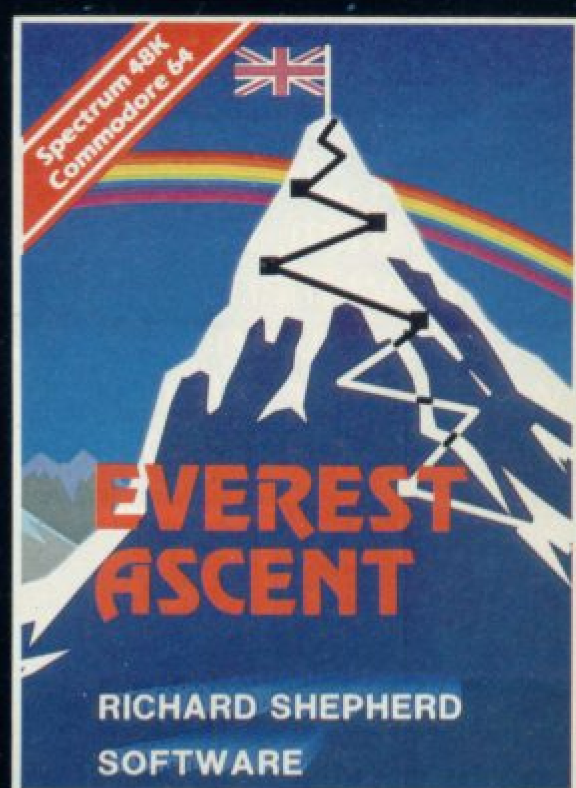
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Ship of the Line

Command a sailing ship, juggle your supplies, crew and firepower. Fearlessly battle your way up the admiralty ladder, bribe Sea Lords as necessary until you make First Sea Lord! **£6.50**



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A brand new original all scrolling super colour animated tuneful multipicture puzzle program
A masterpiece of ingenuity to keep the whole family amused absorbed and enthralled until the next blue moon.
A puzzle for all puzzle haters! You'll be amazed as picture after picture unfolds as reward for your skill, patience and luck.
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Hoping you will not get stuck
To beat the TARGET is so vital
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The Jumbly Code entitles you to enter the Jumbly Competition to design a picture for Jumbly II, due out in 1984. Winners will receive over £150 and have their design and name included in the new program.
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JUMBLY 48K Spectrum (Joystick compatiable)

Introduction to control applications

THE NEW I/O port from Multitron gives the Spectrum a means of communicating with the outside world. Using the port it could control motors, turn lights on and off, or detect when a switch has been closed. It transfers signals to and from the outside in a form the CPU can understand.

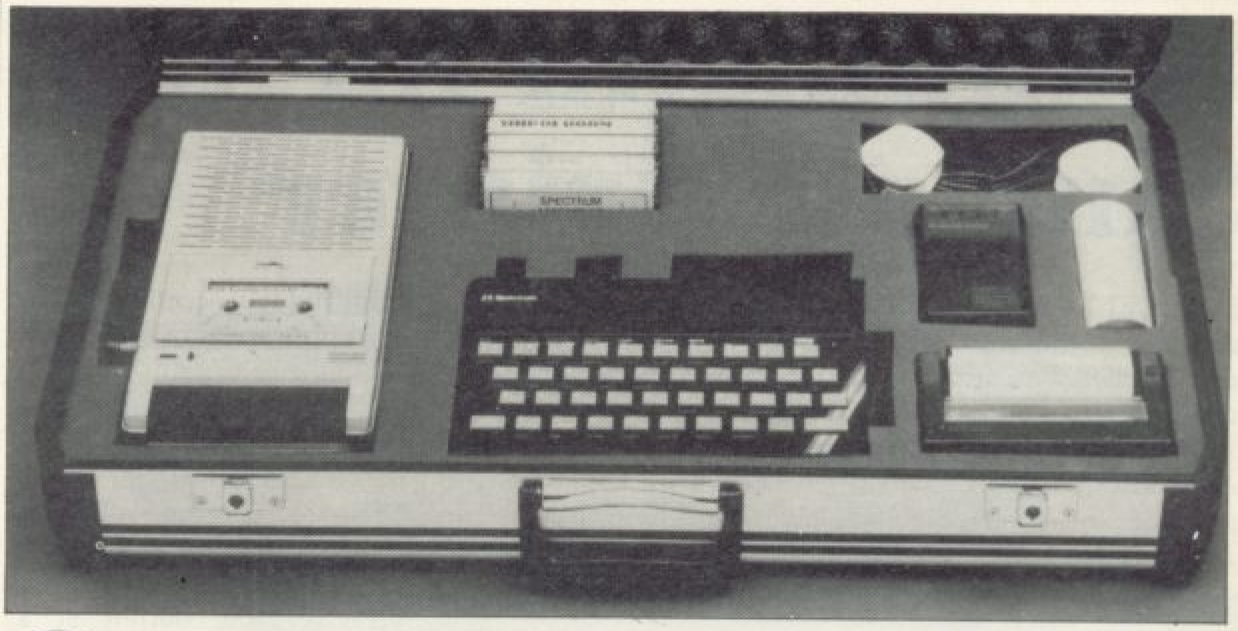
For the technically-minded it is an uncased PCB with through connector based on the Intel 8255 AP-5 chip. The chip has three 8-bit ports — A, B and C — and a control register (D), the addresses being 31, 63, 95 and 127 respectively. Each port can be set to either input or output with the upper and lower nibbles of port C capable of being set independently to either. Two more modes of operation are available, which allow strobed I/O with handshaking and strobed bidirectional operation; in both cases the data can be latched. Details are given in the user manual supplied.

Connections to the board are either by a 28-way Spectrum-style edge connector or soldercon pins — breadboard style. The manual gives comprehensive details of how the port works and how to set it up. It also includes two brief programs, one to make the port test itself and one to show binary numbers being output to LEDs.

One thing it does not do is to give simple circuit diagrams to show how to connect a LED or perhaps a relay.

At a very reasonable £13.50 plus 35 pence p&p, including manual, it provides a cheap introduction to control applications.

The board is available from Multitron, 5 Milton Close, Headless Cross, Redditch, Worcs. B97 5BQ. Tel: 0527 44785.



Computer case which is worth considering

FROM ROTRONICS there is a range of computer cases, suitable for the ZX-81, Spectrum and other computers — Vic-20, Commodore 64 and Oric. The basic case measures 695mm. × 360mm. × 140mm. overall and contains a pre-cut, brushed nylon foam insert in the base to hold the computer, power supply, tape deck, Sinclair printer, paper and cassettes. The top has a cut-out for the manual and a knife is included to make any further modifications.

Uncut foam bases can also be supplied for users to customise their own cases. The case is lockable and when in use the top is removable to allow the base to be used as a workstation.

As the computer cut-out is designed for the computer alone, peripheral owners are presented with a problem. ZX-81 owners with a RAM pack, or similar, will need to make a cut-out in the top foam to accommodate it. Spectrum owners may also experience problems, not only with devices plugged into the edge connector but to fit them into the case the tape deck needs to be repositioned to the right of the computer, the printer behind and the power supply to the back left. That will allow two drives to be put alongside the computer; if a suitable lead could be obtained, there is space for another two behind them. Those modifications can be made easily using the knife supplied but planning and care are required. If your computer normally becomes hot in use it may also be necessary to enlarge the ventilation slot.

The front and back faces of the case are made of extruded aluminium and the end faces of black plastic which, while not the strongest materials available, are sufficient for its designed use. Its only disadvantages are the top and bottom panels which appear to be made of laminated pressed cardboard and would be little more than showerproof.

At £36.99 for the case, with choice of insert and extra inserts at £5.95 the case is worth considering.

Available from SMT, Freepost, Greens Norton, Towcester, Northamptonshire NN12 8BR.

More hardware on page 34.

Useful stop to mains power problems

AT ONE TIME or another many users, especially ZX-81 owners, must have experienced a computer crash when a nearby mains appliance was turned on or off. The Powercleaner from B & R Electrical should prevent that happening. It works by limiting any surges caused by sudden switching to a peak of 625V, almost instantaneously.

The Powercleaner looks like an ordinary mains plug fitted with a 5amp fuse with an over-large back which contains the electronics. When a spike in the power supply occurs the Powercleaner cuts in to smooth the voltage without interrupting the supply to the computer.

If you are experiencing mains problems, the Powercleaner might be a useful addition. B & R Electrical is at Temple Fields, Harlow, Essex. CM20 2BG. Tel: 0279 443351.

Standing in for the Sinclair printer

DEAN ELECTRONICS has announced the introduction of a Sinclair-compatible thermal printer, the Alphacom 32. It is manufactured by the American company which produces the Timex-Sinclair 2040 printer — reviewed in the July *Sinclair User.* The printer is very different from the U.K. Sinclair printer in both external appearance and print quality but is designed to be just as easy to use. It plugs into the rear connector of either a ZX-81 or Spectrum and will accept the standard commands of LPRINT, LLIST and COPY.



That means it can be used in exactly the same manner as the Sinclair, without alteration to existing software. Using 110mm. wide white thermal paper, it produces a very readable output at a speed of roughly two lines per second.

The printer casing is approximately 195 × 140 × 55mm., black-moulded ABS, with a perspex blister on top which holds the paper. Two thick wires emerge from the back, one about 150mm. long to the edge connector which has a ZX-81-size connector to the computer and a through port for RAM packs and the other to the supplied external power supply by way of a male 3.5mm. jack plug.

Inside the printer there is a minimum of electronics, a ROM chip to handle the printer operations, five chips to control the printing mechanism, a handful of discrete components and two PCB-mounted switches to turn the printer on and off and to advance the paper; the use of both switches together performs a self-test function.

The bulk of the space is taken up with a very solid-looking, rubber-mounted, printer mechanism. The mechanism contains, to one side, a 15V motor which, through a series of nylon gears, turns the rubber platen which feeds the paper through and also moves the printhead.

The printhead is made of a ceramic material into which are inlaid 20 wires. As they are moved across the paper they burn off the top surface of the paper to leave a black ink impression.

Each wire covers two character squares in a zig-zag fashion which shows up the only disadvantage of the printer. When producing a copy this zig-zag is noticeable on any solid blocks of ink.

The printer becomes warm in use but that is not a problem as there are adequate ventilation slots on the top and bottom and a large heat-sink inside.

One slight problem, however, is that on a Spectrum the edge connector lead fouls the power lead, making insertion difficult.

Priced at £59.95, including power supply and one roll of paper, with extra rolls of paper at only £1, the printer must be seen as a viable alternative to the Sinclair printer.

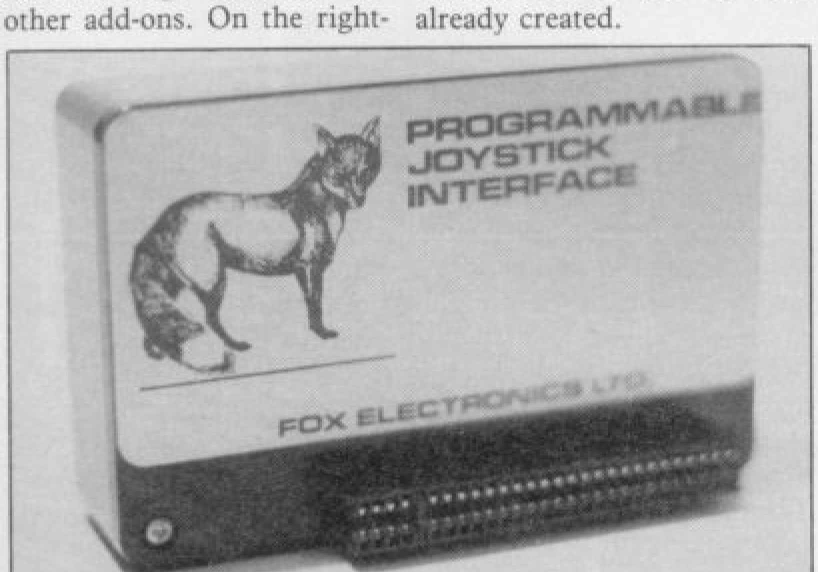
The Alphacom 32 is obtainable from Dean Electronics Ltd, Glendale Park, Fernbank Road, Ascot, Berkshire SL5 8JB and branches of W H Smith.

Joystick with extra touch

INTRODUCTION of a joystick interface to the Spectrum market passes almost unnoticed these days. To have any hope of selling, the interface must not only be state-of-the-art but also have that something extra. The new programmable joystick interface from Fox Electronics is such a device.

It plugs into the rear connector of the Spectrum and has a through connector for other add-ons. On the right-hand side of the case is a standard Atari-type 9-pin socket for the joystick and one switch.

To use the interface all you have to do is put up the switch, which then displays a menu on the screen. You then have the option of creating a new key set from any of the 40 keys, including the shift keys and ENTER, or selecting, with a single keystroke, one of the 16 sets already created.



Pressing the E key exits to Basic ready to load the game and programs the joystick. If necessary, the key sets can be saved on tape. Leaving the switch down makes the Spectrum ignore the interface.

On putting up the switch the interface pages-out the Spectrum ROM and jumps to the program held in its RAM. The program then transfers itself into the Spectrum RAM, pages the ROM back in, and puts the menu on the screen. On pressing the E key the program transfers itself back into its own RAM, sets up the joystick and clears the Spectrum memory. Any new key sets created are therefore saved in the process.

All that is very clever and provides the easiest interface on the market to use.

At £28.50 the interface is very good value from Fox Electronics Ltd., 141, Abbey Road, Basingstoke, Hampshire RG21 9ED.

Backpack could do better job

A NEW IDEA from Kelwood Computer Cases is the range of Backpacks for the Spectrum and ZX-81. They have a range of facilities from a simple LOAD/SAVE-ON/OFF switching device to one which also includes a sound amplifier and a mains distribution board. Also from Kelwood is the Microstation, a large tray on which can be placed a computer, tape deck and choice of Backpack.

Overall, Backpack One does the job it was designed to do but the job could have been done far better. The LOAD/SAVE switch merely switches the EAR signal line and could induce an earth loop, a common problem on the ZX-81; it is also a mains switch and is therefore not really suitable.

The sound board contains a 1W audio amplifier chip, the LM380N. It also contains, among other things, three Mullard 'liquorice-allsorts' capacitors which although they do the job are about 20 times too big.

The volume control is a 1M logarithmic potentiometer which, apart from being too highly-rated, is wired incorrectly and so the volume needs to be turned up to about two-thirds before anything is heard; it then needs fine adjustment.

Finally the overall soldering can have a number of dry joints, which leads to oxidisation and bad connections.

The Microstation is a metal tray approx 445mm. × 435mm. to which five rubber feet have been riveted.

Backpack One seems overpriced at £27.50, as does the Microstation at £7.50. The full range can be obtained from Kelwood Computer Cases, Downs Row, Moorgate, Rotherham S60 2HD. Tel: 0709 63242.



Clip-on joystick helps to zap the aliens

AN ORIGINAL joystick from Grant Designs Ltd, the Spectrum-Stick, clips on to the Spectrum keyboard above the cursor keys 5, 6, 7, and 8 and presses them mechanically in response to the movement of the joystick.

Inside the Spectrum-Stick are two frames which move independently up/down and left/right. To them are attached ramps which push down little feet on to the relevant keys. Despite its ingenious design there are two things to bear in mind. First, the joystick will work only on games which can be configured to use the cursor keys and, second, being made entirely of plastic, it is not so strong as some other joysticks.

Priced at only £9.95, it is far cheaper than anything else on the market and, provided it is used with restraint, will help zap many an alien.

Grant Design, Bank House, Reepham, Norwich, Norfolk NR10 AJJ. Tel: 0603 870852.

Overlay for small fingers

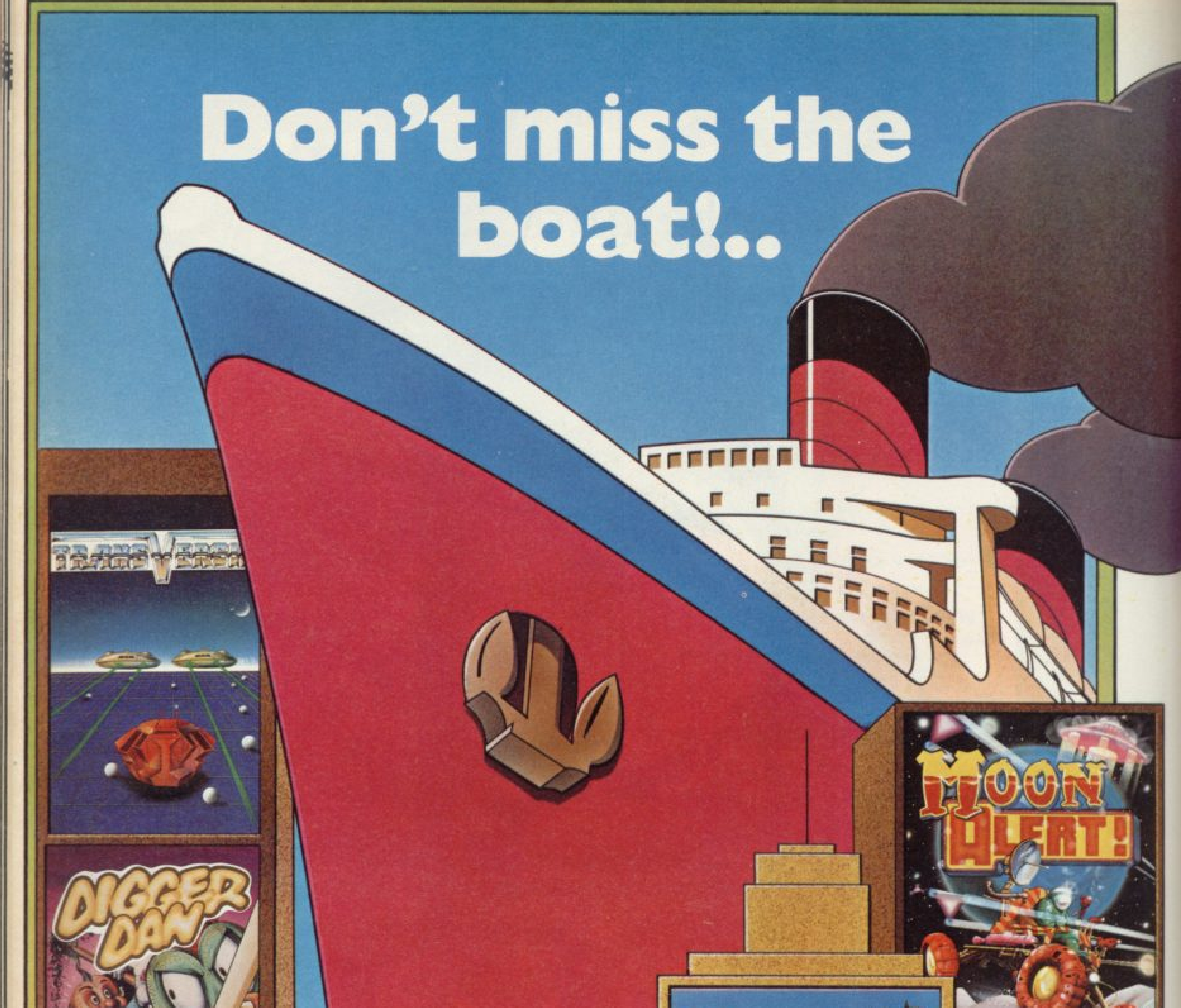


FROM Canada there is yet another ZX-81 keyboard add-on, the Contact Lens from Warren Imports. It is a clear plastic keyboard overlay with wedge-shaped holes which correspond to the key positions.

The idea is that the holes will help position your fingers and enable you to type faster with fewer mistakes. In practice, it ensures that your finger hits the centre of the key but the holes are on the small side and only your nails can touch the key.

Also the plastic covers the legends around the keys, making them difficult to read.

The Contact Lens may be of some use to young children who have difficulty with the ZX-81 keyboard. To obtain one, write to Warren Import Group, 81, Brookmill Blvd, Unit 80, Agincourt, Ontario M1W 2L5, Canada, enclosing $7.95.





Try **Transversion**, if you dare. Eliminate the Alien Pods in their Galactic Grid under the protection of their Guardians. It'll make your green fingers itch with excitement! Only **£5.90**.

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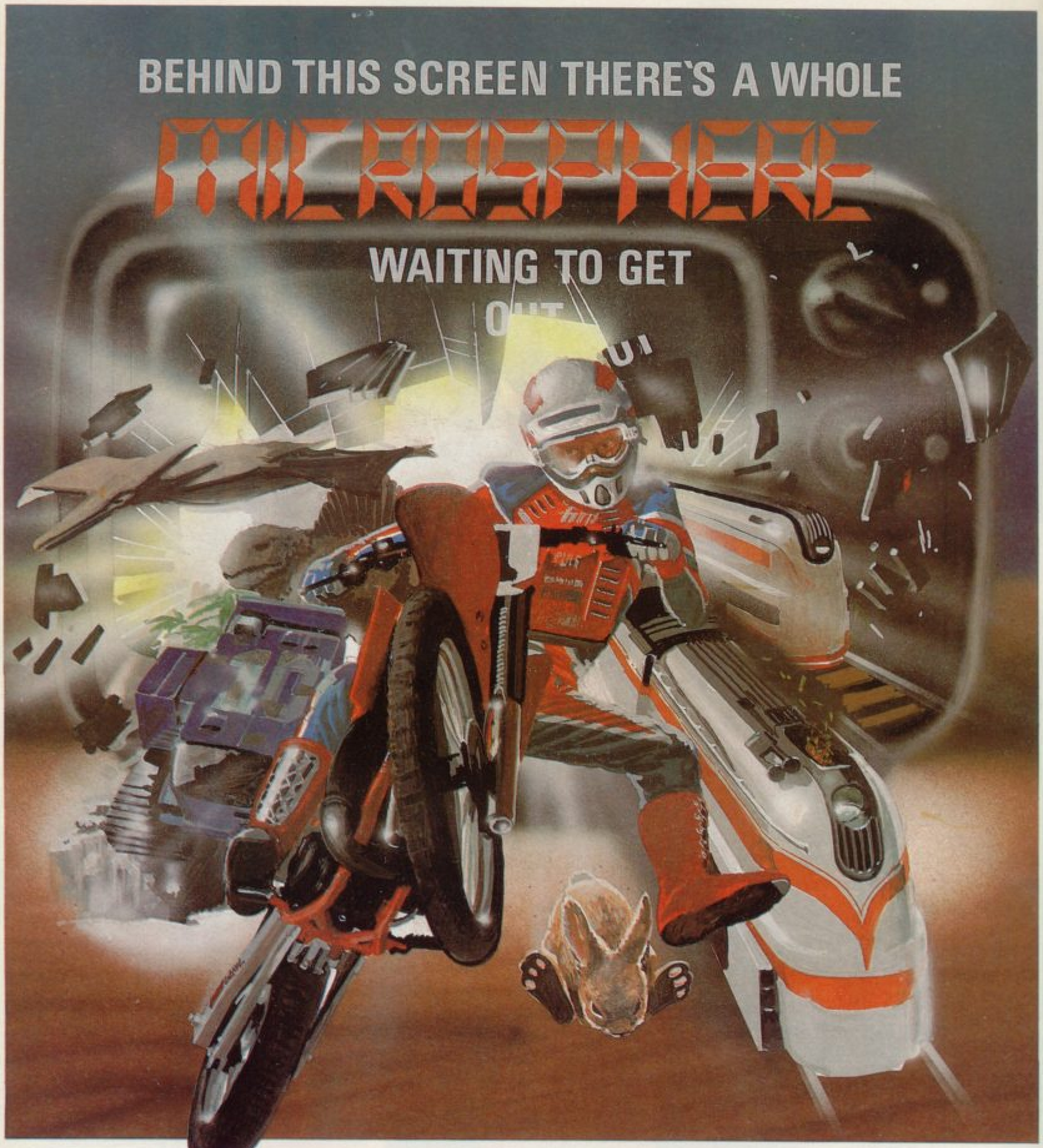
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"Fun, fun, fun to play . . .
(Home Computing Weekly 27/9/83)

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Superb prizes in our two-part competition



The fabulous first prize in our greatest ever competition is Topo, a child-sized robot which follows computer commands via an infra-red signal. Using the interface which we are giving away with the prize, you will be able to guide the multi-talented Topo around the house or classroom using your Spectrum, and even make him speak.

Our second prize winner will receive two Sinclair Research Microdrives, together with an Interface 1, an Interface 2, five blank Microdrive cartridges, and two amazing games cartridges, Tranz Am and Pssst.

The fantastic third prize is a Fidelity colour TV set. Twenty-five runners-up will each receive five games tapes from leading software houses, Artic Computing, Automata, Crystal Computing, and New Generation.

Finally, every one of the prize-winners in our competition will receive a free year's subscription to the exciting new ECC magazine Your Robot, to be published bi-monthly from April 1984.

The competition is in two parts, and all you have to do this month is to devise a program which will produce a graphic representation of a robot, making imaginative use of the colour and graphics capabilities of your Spectrum. DO NOT POST YOUR ENTRY UNTIL YOU HAVE COMPLETED PART 2 OF THE COMPETITION which will appear in our March issue. Two coupons, one from this month's *Sinclair User* and one from next month's, must accompany all entries.

Make sure you don't miss the second instalment of this superb competition by ordering next month's copy of *Sinclair User* now. Set to work on the best picture of a robot that your Spectrum can produce, and good luck!

SINCLAIR USER ROBOT COMPETITION FEBRUARY 1984

Sprites put life into the games of your choice

John Gilbert looks at some of the new designer packages on the market



CREATION and programming of games on the Spectrum has always been left to the imagination of those who had the nerve to enter the world of machine code and had the creative talent to produce such products as **Manic Miner** and **The Corridors of Genon.**

That elite club has been broken by some software companies which have produced packages to allow even a beginner to produce competent arcade and adventure games. Those packages contain machine code routines which can be manipulated to produce the sound and vision necessary for games play.

The first company to produce such a utility package for the creation of arcade games was Quicksilva, with **Games Designer** in 1983.

The user can create up to eight games in the package, each with varying formats and characters. For instance, you could create a mixture of all the classic arcade games using **Space Invaders, Defender** and even **Pacman.** Those characters are limited only to what the imagination of the users can produce.

Quicksilva produced eight example games in the package to show what kind of effects can be obtained. They include mutant hamburgers, flying tanks and jet-propelled spiders. All of those characters are created using a sprite technique.

Sprites are graphics characters, like user-defined graphics on the Spectrum, which are four times the size of one character square. A sprite can be anything which moves in those pre-defined squares and the sprite editor in Games Designer will allow you to set up several of those characters. Most of them have already been used to create aliens for the example games but you can alter them for your own programs. There are also two spare sprites which have not been used for design and you can use them if you wish to start building from scratch.

When you have selected the 'alter sprite' option from the main menu, the computer will display a 12 × 12 grid on the screen with the current shape of the sprite displayed in it. Using the cursor keys you can alter the places in which ink is inserted and omit pieces of the design you do not want.

There are various types of sprite characters you can use and they include aliens, spaceships and explosion sequences. When you have finished altering one of the sprites you can change the colour of the object if necessary by using the 'alter attributes' option on the sprite editor page.

Aliens and explosions can be animated by using several sprites which show progressively the course of the action — like stop-frame photography. When each of the sprites is switched on to the screen in sequence, the characters taking part in the game seem to move. You can change the colour of each individual sprite so that it is possible to make an animated figure, or explosion, flash after each movement.

> "The series of routines should provide a great deal of entertainment and its use is limited only by the creator's ingenuity"

The movement of the sprites round the screen can be achieved by using another main menu option. For movement you must form a pattern of numbers which represent the movement of an individual sprite into an attack wave. Sprites can be made to dive-bomb, swoop on the player-figure, or even to loop the loop. It is possible to change the concept of a game by changing only a few numbers in the movement pattern.

Another important feature of the package, listed on the main menu, is the 'configuration' option. It will allow you to change one game into another and one of its functions is to create the format of the game you are designing.

The format will decide whether the game has the movement patterns of **Galaxians,** invaders, defenders or asteroids and whether your laser base or spaceship moves vertically or horizontally across the screen.

To add to the excitement you can also introduce special effects on to the screen. They include stars if you want your game in space, shields for the defence of spaceships, and a factor which will determine whether the aliens appear individually or in groups.

The other features in Games Designer include a sound generator with which laser zaps can be created. A high score table, like the one Quicksilva uses in its other games, is also included at the end of each of the games created.

When the package is used initially it is novel in concept and many entertaining games can be created using it. Unfortunately there are some snags with the package. You can load and save new games which you have created but they can be used only when the creator program is running. You will also find



that after you have created several games they will all seem similar in movement and content. All you can create is one type of game — zap the objects or be zapped.

Apart from that small criticism the series of routines provided in Games Designer should provide a great deal of entertainment and its use is limited only by the creator's ingenuity.

Melbourne House, publisher of **The Hobbit,** announced a similar product at the same time as Quicksilva. The package, the **HURG,** reached the market later than Games Designer. Its purpose is the same and with it you should be able to create some imaginative arcade games.

The HURG is slightly different from Games Designer as it asks the user questions for the construction of the player shapes which are to be manipulated on the screen.

The package also provides subroutines for creating graphics and sound explosion effects. Like Games Designer, the software created using it can be played only with the HURG control program. That makes the two packages alike, the only major difference in concept and design being that Melbourne House has only three example programs in its package as opposed to the Quicksilva eight.

If you do not like arcade games, or become disenchanted with them, you might like to try writing adventure games in machine code without the trouble of writing the code. **The Quill,** from Gilsoft, will set up a database for your own textual adventure and all you have to do is enter the text and directions of the locations through which you want the player to move. You can then enter the items which can be found in the adventure scenario and the locations into which they should be situated.

Provided with the program is an excellent manual which takes the user through the setting-up procedure of a simple adventure scenario, as well as showing the meaning of all the options on the main menu.

The adventures need not consist only of picking up objects or moving around locations. The machine code routines in The Quill will allow complex adventure actions, including switching torches on and off and providing specific actions for players to perform, such as eating apples, shaking leaves from a tree, or wearing a hat.

Once you have finished setting up the options you want to enter into your adventure you can test it by using the demonstration mode. You can go through the locations and test all the traps without destroying the main database creator.

If there is something which is incorrect in the scenarios you can change them by using the database editor. When finally you are pleased with the adventure you have created you can SAVE it to tape. Unlike the two arcade games designers, the adventures you create using The Quill can be run independently from the control and creator program. Gilsoft will permit users to market games which have been created using it so long as its name is displayed prominently on all labelling.

It has also gone to the lengths of describing The Quill program and how it produces an adventure game. That means you have complete control over what you produce and an interesting insight into a program which should keep adventure players happy for a long time.

Unlike the arcade games designers there are virtually no limits to what type of adventure scenario you produce. Program generators provide an excellent opportunity for users of the Spectrum to produce games and not to rely so much on professional manufacturers. It must be said, however, that the arcade and adventure games which you produce will provide few surprises when you play them. The packages available allow you to write games for other people to play. There is nothing more uninteresting than playing your own adventure games.

The generators will provide a good deal of fun but are more likely to be used as utilities and not as a replacement for professional software.

Professional manufacturers will still provide the quality and originality in software. No package, even if it is brilliant in the production of games using the sausage machine technique, will provide an answer to properly machine-coded and original games.

"If you do not like arcade games, you might like to try writing adventure games without the trouble of writing the code"

Quicksilva Ltd, Palmerston Park House, 13 Palmerston Road, Southampton, Hampshire SO1 1LL.

Melbourne House, 131 Trafalgar Road, Greenwich, London SE10.

Gilsoft, 30 Hawthorn Road, Barry, South Glamorgan.

E COMPATIBILITY

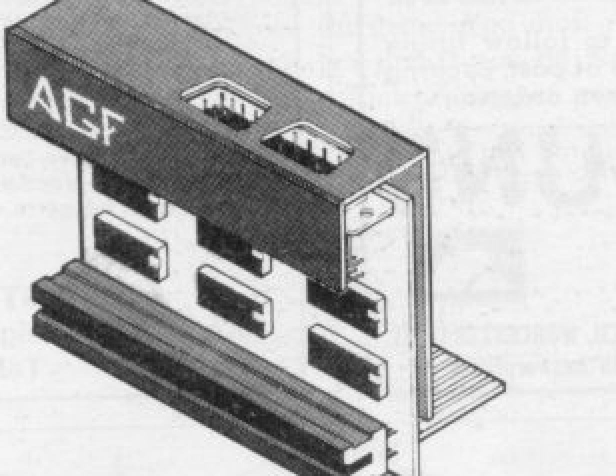
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Cyber Rats	: Silversoft	£5.95

COMPATIBILITY CASSETTES £4.95

These cassettes have short programs to load before the chosen game which will convert it to use the cursor keys and therefore become compatible with the Interface Module II.

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Schizoids	Planetoids
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Horace Goes Skiing	† Pssst
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Penetrator	† Invaders

† Will require 48K Memory.

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The Computer Shop
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The Computer Centre (Humberside) Ltd
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An excellent introduction

THREE GAMES are included on the cassette which supplements a book, *ZX-81/TS 1000 Programming for Young Programmers,* published by McGraw Hill.

Two of the games, **Bomb Run** and **Mazer,** are written in machine code for 1K machines and manage to provide plenty of action and entertainment. In Bomb Run, you are in an aircraft which loses altitude on each run and you must bomb various buildings out of your way before you crash into them. You have only a limited number of missiles, so it is important to use them sparingly and accurately.

Mazer is a simple maze game in which the object is to avoid the ghost and stay on the move as long as possible. Each time you move, you score a point. Novices will enjoy the ease of scoring and the practical layout of the keyboard; any key in the top row moves you up, any key in the bottom row moves you down, and the left- and right-hand sides of the keyboard will move left and right respectively. Both games allow you to start again easily if you crash or are eaten by ghosts.

Golems for the 16K Spectrum is a more complicated strategy and fantasy adventure game in which your object is to outwit the Lord of the Black Tower.

The cassettes also include programs which are listed in the book, including **Hangman, Sketcher** and **Owl Swoop,** with additional graphics and other improvements.

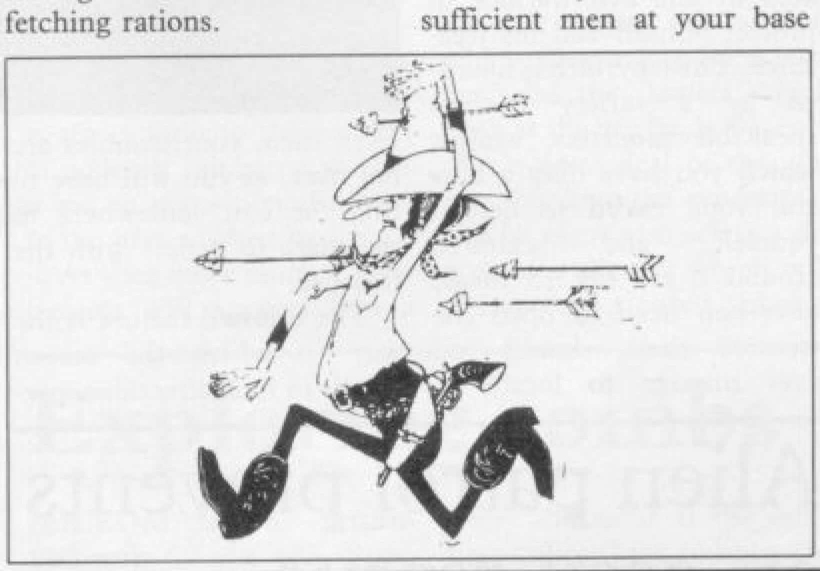
Together the book and cassette form an excellent introduction to Basic programming on the ZX-81. They are available from McGraw Hill Book Co, Shoppenhangers Road, Maidenhead, Berkshire. The cassette costs £5.95.

Siege tactics win at the end of the day

IF YOU have ever fancied yourself as a military strategist, you should enjoy **Fort Apache** for the 16K ZX-81. In it you assume the role of a general with 300 men in his command. Your aim is to attack a fort and destroy its walls and, for each day of your siege, you must assign men to such tasks as building ramps, ladders and battering rams, manning cannons, collecting ammunition and fetching rations.

You then decide whether to attack the gate of the fort, scale its walls, or tunnel beneath them. At the end of the day, the computer will tell you the result of the engagement, including how many men you have lost and how many rations have been stolen.

If you lose more than half of your troops you have lost the game. You must remember that if you do not leave sufficient men at your base camp, the fort defenders might sally forth and attack you; if you do not feed your troops adequately, they may desert.



In spite of the fact that battering rams and ramps seem inappropriate weapons for attacking an Apache fort, the options and results of your decisions are reasonably realistic, making it an absorbing game, despite its simple presentation and lack of graphics.

Provided you do not suffer a particularly disastrous defeat, you can continue your siege for days, keeping any supplies of food and weapons you have accumulated from one day to the next. You can also try different tactics to see if you can outwit the defenders.

The siege of Fort Apache is produced by Contrast Software, Farnham Road, West Liss, Hampshire GU33 6JU. It costs £4.95

Complex galactic conflict

YOU WILL need at least one opponent, writing materials and plenty of time for **Cyborg Wars,** produced by Stratagem Cybernetics for the Timex Sinclair or the 16K ZX-81.

A complex strategy game for up to four players, Cyborg Wars is an imaginary galactic conflict between four nations of androids battling over the resources of a small asteroid. Each player takes the role of the ruler of one of the nations and can send spies to enemy states, convert farmers to soldiers, stockpile rations, or decide to launch an attack against any other nation. The outcome of such battles is decided by the computer, and the ruler's fortunes will fluctuate accordingly.

The eventual aim is either to establish dominion over the entire asteroid or to depose all the other rulers. The game continues from year to year, with the computer issuing a report on the state of each country's resources at the end of each year — or round. If 35 years go by without a military confrontation, the ruler who can boast the biggest population is the winner.

The cassette is accompanied by record sheets on which the players can keep track of population figures, spies lost, rations, crops and other vital statistics. The fact that Cyborg Wars has to rely on such old-fashioned methods somewhat detracts from its value as a computer game.

The game is in two parts and the instructions in the accompanying booklet must be followed very closely if the game is to be loaded successfully. It is important not to make typing errors when inputting your password — make sure that you can reproduce them if you make any — or you will not be able to proceed.

Despite those disadvantages it is a carefully-thought-out and elaborate game, providing ample scope for entertainment for anyone who has patience and a taste for games involving a mixture of luck and judgment.

Cyborg Wars is available by mail order only from Stratagem Cybernetics, 286 Corbin Place, New York 11235, New York, USA. The cassette cost $15.



Leave the Spanish all at sea

IN PLUNDER, for the 48K Spectrum, the scene is set in the 16th century, which makes a welcome change from space travel and aliens. As captain of a British galleon, your task is to patrol the seas and prevent the Spanish bringing back gold across the Atlantic with which to finance their Armada.

Your eventual object is to earn a knighthood for services to your country and also to make sure you outdo your hated rival Sir Francis Drake, who will "fall about laughing" every time you run the ship aground or similarly disgrace yourself.

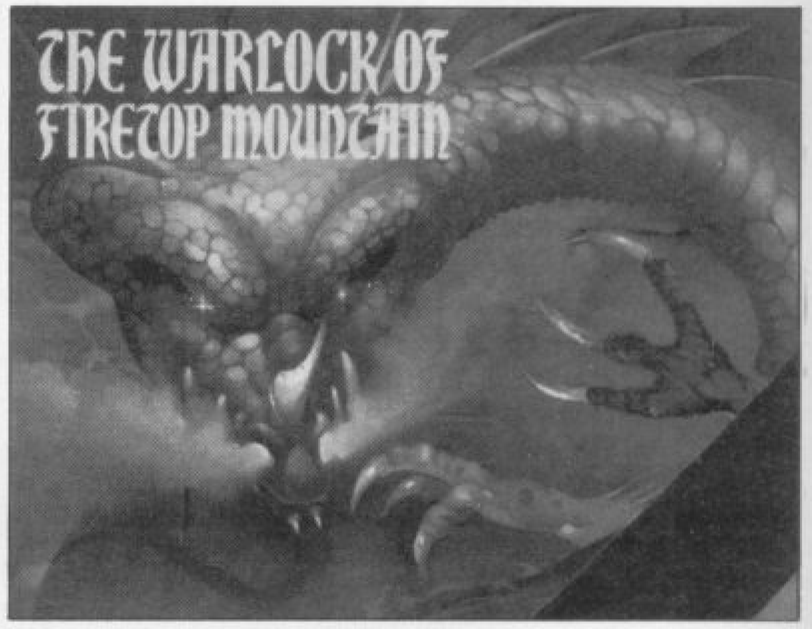
Plunder also allows you to manoeuvre your ship into port, trade in bazaars to increase your assets, and investigate uncharted islands. In spite of the scope for variety the game provides, it is easy to engage in a repetitive series of sea battles and the slow graphics detract from any advantage it might have over a board game.

It is also a pity that each time you lose a round you have to return to the title page before you can start again. A little seafaring practice should enable you to avoid the pitfalls and derive some entertainment from an interesting concept.

Plunder is produced by Cases Computer Simulations, 14 Langton Way, London SE3 7TL, and costs £6.00.

Fantasy labyrinth full of complexity

THE WARLOCK of Firetop Mountain for the 48K Spectrum is the computer version of the popular Penguin Books fantasy adventure of the same name. You can buy the two together in a smartly-presented pack or choose the book or the cassette separately.



The cassette offers a fast and unusual game in which you must imagine you are lost in a vast labyrinth created by the evil warlock to protect himself and his treasures. The labyrinth is haunted by a variety of unspeakable monsters, against which you have only a bow and your sword to defend yourself, and scattered around it are the 15 magic keys you need to open the treasure chest, should you ever manage to locate it. Even then, your troubles are not over, as you will have to find the exit somewhere in the maze to depart with the treasure.

The unusual feature is the way in which the screen scrolls in four directions, presenting you with a change of scene each time.

The computer generates the maze randomly and the number of keys needed to move about, open doors, draw the sword and fire arrows adds to the complexity.

Mastering the controls and improving the speed with which you move around the maze make for an addictive pastime and there is the lure of the magic keys, which increase your score dramatically whenever you pick one up.

The lack of incident in the game, with the monsters and keys appearing only rarely, might make it seem monotonous after a time.

It is also a pity that whenever you lose a battle with one of the monsters, which is all too easily done, the game is finished and you have to start again. Some way of recovering from an encounter or of replenishing one's strength along the journey might have added interest to the adventure.

The Warlock of Firetop Mountain is produced by Penguin Books, 536 King's Road, London SW10 0UH. It costs £5.50 on its own or £6.95 in the software pack containing the book and cassette.

Alien patrol prevents an easy rescue

ANYONE who has played Donkey Kong will find **Godzilla and the Martians** for the 16K Spectrum familiar. The gorilla at the summit of a series of ladders has been changed into a dinosaur which is protecting the girl of your dreams from the evil intent of invading Martians; your object is to get to the top and rescue her before your oxygen supplies run out.

You will have to be very proficient on a keyboard to achieve that aim. As the groups of Martians patrol each level, you have to jump over them one by one and when you manage to reach the next level, you will find a series of man traps which it is all too easy to fall through.



Inexpert players will find the game finishes very quickly and a major disadvantage is that you do not get extra lives but must start each game from the beginning.

More explanation about the scoring system would also have been an improvement. Nevertheless, Godzilla and the Martians will probably appeal to experienced arcade games players who enjoy a challenge to their dexterity. It is available from Temptation Software, 27 Cinque Ports Street, Rye, East Sussex and costs £5.95.



Card game better with real players

CONTRAST Software has produced a tape for the 48K Spectrum called **Pontoon** which has little to commend it to anyone who has played the original card game.

Without real-life opponents you can bluff and stakes with which to gamble, whether cash or matchsticks, this simple game loses much of its attraction.

The Contrast version does not have the presentation to compensate for the deficiencies of the computer as a medium for playing pontoon. Although the responses are fast, the cards are too small to make an interesting screen and it is not possible to bet more than a single-digit number, so that even if you want to do so you cannot gamble your entire wealth on the turn of a single card.

The tape also includes computer versions of Cribbage and Mastermind, with simple screen instructions which are difficult to follow if you have never played either game. It is also a pity that there is no menu option at the start of the tape, so that you have to load each game separately.

Pontoon is available from Contrast Software, Farnham Road, West Liss, Hampshire GU33 6JU and costs £4.95.

Birds and bees reveal true facts of life

THE NAME **The Birds and the Bees** may conjure idyllic images of peaceful summer days but the new Bug-Byte game for the 48K Spectrum finally will reveal how tough life can be for a bee.

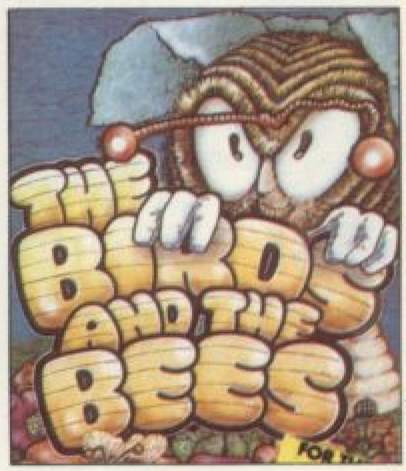
On a screen which scrolls left and right, you must pilot your bee from flower to flower, picking up pollen to earn yourself points, and avoiding hostile birds and centipedes. The more pollen the bee picks up, the heavier it becomes, making it increasingly easy prey for the birds. There is also a limit to the amount of pollen it can carry, so that it has to make periodic trips to the hive to shed its load.

As your score mounts, new hazards will appear; first a swarm of bees and then a bear intent on raiding the hive for its store of honey.

This is not only a genuinely original game but a very entertaining and appealing one. The graphics are attractive and the movements, with the bee swooping uncontrollably up and down and the birds dive-bombing with deadly accuracy, are an ingenious reproduction of real-life conditions in the fields.

Details such as an animated title page, the aircraft which flies a Bug-Byte banner, and the flowers which open as the bee lands all show that a great deal of thought has gone into the product.

The game also offers a degree of difficulty which will satisfy experienced players



and lure less-experienced ones to try to improve their skills.

The Birds and the Bees is sold by Bug-Byte Software, Mulberry House, Canning Place, Liverpool L1 8JB. It is obtainable from computer branches of W H Smith and costs £5.95.

Exploring tombs is fun

MICROMANIA'S **Tutankhamun** for the 48K Spectrum is a maze-type arcade game with sufficient variety and incident to provide hours of entertainment.

The game features an explorer searching a Pharoah's tomb for treasure while being pursued by cobras, spiders, skulls and mummies. He can fire against the monsters, but only horizontally, with his laser, and must at the same time collect keys to open the doors between one part of the tomb and another. Picking up treasure increases your score and you have to make your escape with the treasure before your time runs out.

One of the assets of the game is that the screen scrolls left and right, so that you have a constantly-changing setting, and a wraparound facility for the explorer at the top and bottom of the screen maintains the smooth flow of the action.



There are also five tombs from which to choose, each with a small-scale map at the top of the screen for reference.

Any of the tombs bears exploring several times to find the best route, without dangerous dead-ends, to the central treasure chamber.

Another advantage of the the carefully-designed game is that although the various monsters present you with plenty of difficulty and challenge, you do not have to face the discouragement of starting again every time you are zapped; you have several lives to resume your search from wherever you finished.

Tutankhamun is available from Micromania, 14 Lower Hill Road, Epsom. Surrey KT19 8LT. It costs £5.95.

More software on page 52



Fast action in arcade favourites

KRAZY KONG and Frogger are two original arcade games which PSS has converted to the 16K Spectrum. The name of the latter game has been changed to **Hopper.**

In **Krazy Kong** you have to get up a tower of scaffolding, using a series of ladders, to save Jane from King Kong, avoiding fireballs, barrels, pies, lifts and flans.

If that is not difficult enough the authors have made it almost impossible to get a good control of the movement keys, as they are so close together. You may also have difficulty starting the game, as the control keys are in the top left-hand corner of the keyboard and the start key is at the bottom right.

Hopper is not much easier, although the control keys are all in a better position for play. The difficulty is in the speed of movement which can make you take several jumps at a time.

All the usual elements are there, including turtles, crocodiles, a train and some fast cars on the highway but they make the screen overcrowded and it is difficult to follow the path of your frog. That does not make the game unusable but it would be suited to those with knowledge of Frogger who can cope with fast play or many options — is not the beginner.

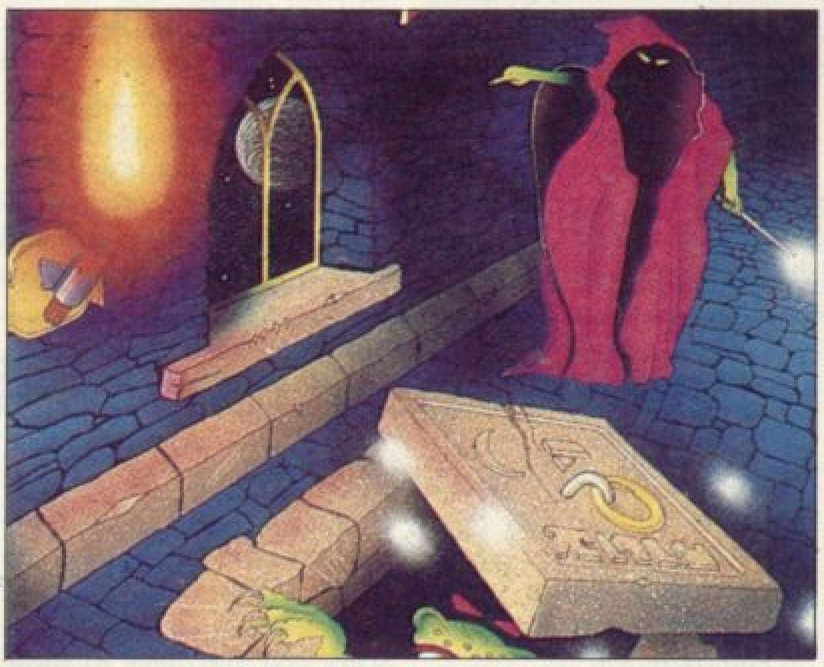
Both games can be obtained from PSS, 452 Stoney Stanton Road, Coventry, CV6 5DG. Cost: £5.95 each.

Dangerous castle is highly recommended

DEEP DUNGEONS and an attic full of ghosts, witches and spiders await the player of **Atic Atac** for the 48K Spectrum.

At the start of the colourful game you can choose one of the characters available and they include a wizard, knight and serf. Each of the characters uses a different weapon. The wizard uses a fireball, the serf a short sword and the knight an axe.

When your character is set, you will be transported to a three-dimensional representation of the entrance hall to the castle. To pass the entrance door you have to find the golden key. On the way you have to pick up food to keep you going. The authors have created an amusing and original representation of the strength of characters as it is whittled away by the attacking monsters. At the right of the screen is a turkey which, at the start of the game, has all its flesh. As the monsters attack the turkey will lose its skin and become bones. When it has been picked clean you lose one of your three lives.



Dotted around several of the rooms—which you will enter—are time-warp generators which, if not locked, will transfer you to another room or floor. There are also barred doors through which, on occasions, you will be able to pass to other rooms.

The lower levels of the castle are probably the most dangerous because they have specific monsters like Dracula and Frankenstein's monster. They can be destroyed only with objects which you collect and not with the weapon you are given at the start of the game.

Atic Atac is highly recommended for children and adults as the depth of plot and the GAS graphics make it a superb game. It can be obtained from Ultimate Play the Game, The Green, Ashby de la Zouch, Leicestershire LE6 5JU. It costs £5.50.

Picture puzzle for sleuths

DEVOTEES of murder mysteries might like to try their deductive skills on **Murder at the Manor,** a graphics adventure for the 48K Spectrum. The local squire has been murdered by a thief in search of the squire's hoard of gold coins. Making good his escape, the murderer has scattered about the countryside pieces of a page containing the combination number of the squire's safe which still contains a vital clue. It is your job to find the combination, the clue and the identity of the murderer.

The search starts at the town cross, from which paths lead to various shops, the police station, the car park, the church or the open countryside—beware of the sheep. As you reach each location, a picture of it unfolds and a compass in the corner of the screen shows which way you can go.

Walking about or fighting with any of the characters you encounter will sap your strength and eating any food you are lucky enough to find will restore it. If you run out of strength before you have solved the mystery, you lose the game.

At any stage you can check your score, the clues you hold and your strength level.

The computer understands a comprehensive range of commands in this ingenious adventure and the graphics are attractive but a major fault is that the relationship between the various locations is not always consistent, so that however carefully you keep track of your movements, you may find yourself returning to the same spot repeatedly. The time it takes for each picture to appear also slows the game.

Murder at the Manor is available from Gemtime, 16 Ben Ledi Road, Kirkcaldy, Fife, and costs £6.95.



Hamburger ingredients are elusive

MR WIMPY for the 48K Spectrum is an unusual product in more ways than one. Commissioned by Wimpy International, it is billed as the first British computer game to feature a promotional character, complete with company logo and advertising jingle.

Mr Wimpy manages to be an entertaining game in its own right. It has eight levels of difficulty and the first screen entails guiding Mr Wimpy across the screen with his tray to collect the ingredients he needs to make his hamburgers.

On his way, he has to avoid manholes which engulf him and the burger thief who darts about intent on upsetting his tray, compelling him each time to return to the start and collect another one. If he manages to assemble his ingredients, the next level brings out the kitchen rebels in the form of Oggy Egg and Syd Sos.

The game can be played with a joystick and if you are using the keyboard you are unlikely to be able to match the speed of most hamburger restaurants in taking food to the table. The action is extremely fast and steering Mr Wimpy across the screen and back again without mishap is a feat possible for only the very expert player.

Mr Wimpy is produced by Ocean Software, Ralli Building, Stanley Street, Manchester M3 5FD, and costs £5.90.

3D maze game is not for the beginner

STRIKING 3D graphics are the outstanding feature of **Android 2,** a complex arcade adventure for the 48K Spectrum from Vortex Software. The game starts as you swoop over the Death Maze in your space transporter. As you land, you are confronted by a host of hazards such as millitoids, hoverdroids, bouncers and land mines which can remove your five lives.



Your objective is to kill all five millitoids before returning to your transporter, which will then take you to the Paradox Zone and finally to the Flatlands where your mission ends.

This well-presented game is definitely not for beginners. The millitoids have to be blasted three times before they disappear and there is only a limited amount of time before your transporter takes off without you, so that getting out of the maze and on to the next level is a challenging task.

Skilled players, however, should derive some satisfaction from the game, which features a scrolling screen and a great deal of fast action. Your score, and the number of lives you have remaining, are shown on the right of the screen, where there is also a grid showing your exact position in the maze, as well as a gauge telling you how much time remains before your transporter takes off.

Android 2 is produced by Vortex Software, 280 Brooklands Road, Manchester M23 9HD and costs £5.95.

Holiday a welcome change

SEQUELS are often a disappointment but anyone who enjoyed the Mikro-Gen Mad Martha will probably be happy to add **Mad Martha II** for the 48K Spectrum to their collection.

Subtitled **Henry Sails the Spanish Main,** the lively graphics adventure is set in a Spanish holiday resort, as is clearly indicated by the blazing sun and a spirited rendering of *Viva España* at the start of the game.



The story features such things as a perfumed letter, a succession of doors, a dark alley and a bullfight. Events unfold at a brisk pace, with plenty of variety in the locations and incidents. You may well find yourself on a beach or in a hotel bar, or blundering on to someone else's balcony, a faux pas which will land you in the local jail.

There is also a challenging maze game played against the clock to enliven the action, although you may want to avoid it if you suffer from slow fingers. The game also features a good sprinkling of useful objects such as spectacles and matchboxes to find.

Although the commands which the computer understands are limited, the graphics are unsophisticated and the author's grasp of Spanish appears shaky, it is a well-constructed adventure in which it is possible to keep track of one's movements and explore new areas when replaying the game. You can choose between three levels of difficulty and the setting and light-hearted approach make a welcome change from the gothic castles and space odysseys of so many other adventure games.

Mad Martha II is produced by Mikro-Gen, 1 Devonshire Cottages, London Road, Bracknell, Berkshire RG12 2TQ. It costs £6.95.



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ALL-TIME CLASSIC!
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CORKS!
I'VE GOT A SHIP OUTSIDE YOU JUST WON'T BE ABLE TO RESIST!
HOW MUCH?
WELL, 'OW MUCH 'AVE YOU GOT?
A POGO-STICK, A SAXOPHONE AND A CAN OF WORMS
WELL THAT'S 'OW MUCH IT IS! SIGN HERE, HERE AN' HERE!
TATTAH, MUGGINS!
OY! I THOUGHT I'D JUST BOUGHT THAT!
LOOK AT THE LOG-BOOK! IT IS I YOU'VE PAID YOUR HARD-EARNED WORMS FOR! BEEP!
EH, WOT?
WHAT DO YOU KEEP STOPPING FOR?
BEERP! CAR-SICKNESS!
CAR PARK
LEMME OUTTA HERE, YA BUM!
NOW TO RETRIEVE MORRIS SO THAT I CAN SELL HIM TO SOME OTHER MUG! GO, MY PHANTOM PHREAKY BIKERS!
TELEPORT BEAM
I'M FREE! TAKEEEE!!
TOO LATE! THE MAD BIKERS BLAZE IN, LIKE GHOSTS THROUGH THE BRICK WALL...
THIS IS IT!
MORRIS meets the Bikers
WATCH OUT FOR.....
...CREEPY CARBON MONOXIDE...
LOONY LIFTS
ELEVATOR
PRECIOUS PETROL
GRRR!
...TREACHEROUS TIN-TACKS THAT SLOW HIM DOWN...
AND CLINGING WHEEL CLAMPS THAT BRING HIM TO A GRINDING HALT...
HSSSS
YOW!
AND HAS TO COLLECT TEN GOLDEN COINS BEFORE HE CAN ESCAPE THROUGH THE EXIT TO THE NEXT SCREEN. THERE ARE 9 SCREENS ALTOGETHER, BEFORE HE IS FREE!
MAYBE WE DON'T LIKE THE NOISE HIS HORN MAKES, AN' MAYBE WE CAN'T GET HIM IN THE LIFTS - BUT WE CAN FLY THROUGH WALLS, AN WE DON'T CARE ABOUT NO HAND-SIGGERNALS OR DOUBLE-YELLER LINES! HAR HAR!!
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Paddle your own canoe with the ZX-81

Outdoor enthusiast Keith Ratcliffe gets physical with his computer. Nicole Segre reports

IF YOU LIKE the idea of crossing a rapidly-flowing stream without leaving the comfort of your front room, a program by Keith Ratcliffe, a canoeing enthusiast from Chapel-en-le-Frith, near Stockport, might be just what you need. Using a simple game formula, the program printed opposite demonstrates how to get from one bank to another in a canoe by choosing the proper speed and angle to combat the strength of the current.

All Ratcliffe's programs combine his interest in outdoor sports with the arm-chair joys of computing. He has written a rock-climbing program, based on a real-life climb, which is intended to teach the novice how to make the correct decisions about choosing a route, conserving strength and using tools to reach the top of the rock face. One false move can lead to a fatal fall, a game element which adds a touch of spice to a serious training program.

Another of his programs simulates a slalom canoe race, the speciality which he and his wife Geraldine consider their main hobby. There is also a simple file program to list the calendar of canoe racing events through the year and another more complicated one for the calculation of race results as they are received, a laborious process which usually occupies several people at any slalom event.

It is all done on a 16K ZX-81 which Ratcliffe bought for £50, including RAM pack, last March. "That was cheap at the time," he recalls, "although it would not cost much more for the whole lot new today."

The price of the machine was of prime importance to Ratcliffe because he had just been made redundant from a job for which he had moved his family to the Stockport area. Formerly a teacher in an outdoor centre in the Lake District, he had gone to Chapel-en-le-Frith to take a job as a youth worker with the Greater Manchester Youth Association, only to be phased-out barely a year later. It was as a result of that that he bought his ZX-81, on the suggestion of a colleague who recommended computing as a cheap and mentally-stimulating hobby to occupy his leisure time.

"As it turned out, I did not have much spare time," he says, "as I was back in full-time work only a month later but that did not mean that the computer was neglected."

Ratcliffe now works for the Buxton Action Community Team, a part of the Manpower Services Commission youth training scheme. The objective is to provide practical experience for youngsters who leave school with few or no qualifications by finding short-term work for them in the community, combined with off-the-job training at local colleges in basic skills such as numeracy and literacy. The course also includes an introduction to computers and Ratcliffe has taken that part of the scheme upon himself by using his ZX-81.

"I devised a simple statistical program in which all the students put in vital facts about themselves, such as their height, weight, and age, and the computer then draws a bar chart." As a reward for their efforts, Ratcliffe also allows students to play a commercially-bought game, Mazogs, in their spare time. "It always goes down very well,"

he says, "and helps to make computing seem much more attractive."

Ratcliffe plans to make wider use of his canoeing programs, which were written for amusement but could help canoeing clubs to pass the time in the winter months. He hopes that Manchester Canoeing Club, which he joined recently, will soon be using his crossing-the-river game and the slalom canoe race simulation as a training aid.

Ratcliffe also submitted his race results programs to the British Canoe Union. To his amazement, the union not only wrote to say that other canoeing clubs were already using computer programs to analyse results but even included several pages of guidelines on what such programs should include, together with a sample program to use as a basis.

"Drawing-up the results of a slalom race is a complicated process," Ratcliffe explains. "Competitors have to participate in two races. Then a percentage rating is drawn-up which compares each competitor's performance in two separate events, so that differences in the distances and weather conditions are taken into account.

"The result of those calculations gives the competitor's new ranking, rather like a football club's move up and down the divisions, which is re-adjusted at each new event. When you have 100 or so competitors, it all becomes a bit of a headache."

That explains why canoeists have resorted so eagerly to computers but Ratcliffe feels he has one advantage over the others. "No-one else seems to be using a ZX-81 and there must be many of them hidden in various clubs all over the country," he says. Ratcliffe is happy with his ZX-81, which he says has proved adequate for his purposes, and has no plans to upgrade to a Spectrum or any other machine. "The programs I have written so far do not need colour or sound," he says. "In fact, I have derived as much use from my ZX-81 as from the mainframe computer I used for my mechanical engineering studies at the University of East Anglia."

One of Ratcliffe's projects as a



research student was to study the movements of sediment in the Wash, and he used the university computer to produce "a gorgeous tidal chart full of Os and Is". That gave him a taste for computing which his ZX-81 has revived.

Ratcliffe owns only two commercially-bought tapes, Mazogs and Vu-File, and generally keeps outlay on the machine to a minimum. He overcame initial loading problems by buying Dixons least expensive tape recorder and has added a £10 keyboard, the File 60, to make the machine easier to use for his two daughters, aged two and four. The older is already proving proficient at several programs taken from listings in books and magazines, including a simple game, Fisherman, to teach co-ordination, and another to learn the difference between left and right.

Ratcliffe estimates that he spends an average of six hours a week on his computer and wishes he had more time to devote to it, "but there are too many other things to do," he says. During the summer months, he spends one evening a week rock climbing and the family goes canoe racing every weekend.

"It used to be my wife's speciality before we married," he says. "She persuaded me to take it up last year and it makes a marvellous family activity. The children like cheering us from the bank." As the family lives on the edge of the Peak district, there are also walks to be enjoyed whenever the weather is fine.

Besides his other hobbies, Ratcliffe is a keen amateur photographer and thinks that one day he might write a program for his computer to control exposure times in his darkroom. "For the moment, I find it easier to use a clock," he says.

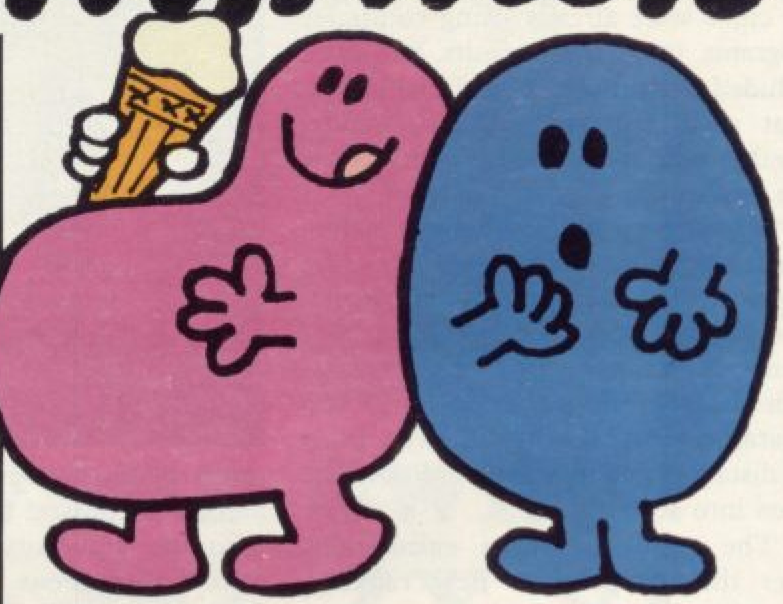
Another plan concerns a simulation sailing program, another of his interests. "We have a dinghy in the back garden," he says, "but we never get around to using it."

Ratcliffe says that he is not a "computer freak" but the ZX-81, together with his other hobbies, fills ever available moment. "If I were ever made redundant again," he says, "I would have no difficulty knowing how to occupy my time."

```
5 REM "FERRYGLIDE"
10 LET CU=0.1*INT (10+RND*50)
15 PRINT AT 0,0;"(15*1sP 9a 15
*1sP )"
20 PRINT AT 21,0;"(15*1sP 9a 1
5*1sP )"
25 PRINT AT 5,0;"CURRENT";CU;"
MPH"
30 PRINT AT 6,0;"PADDLING SPEE
D?";
35 INPUT VEL
40 PRINT AT 6,19;VEL,"ANGLE TO
CURRENT?";
45 INPUT ANG
50 PRINT AT 7,19;ANG
51 LET ANG=PI*ANG/180
55 LET Y=1
56 LET X=31
60 FOR N=0 TO 39
65 LET DY=1
70 LET UN=0.8*CU*4*N*(39-N)/39
**2
75 LET DX=4*((VEL*COS ANG)-UN)
/(VEL*SIN ANG)
80 LET X=X+DX
85 LET Y=Y+DY
86 IF X>62 THEN GOTO 300
87 IF X<1 THEN GOTO 310
90 PLOT X,Y
92 IF RND<0.125 THEN GOSUB 149
5
95 NEXT N
100 IF INT X=31 OR INT X=32 THE
N GOTO 1000
200 PAUSE 1E3
205 CLS
206 GOTO 15
300 PRINT AT 10,0;"ANGLE TOO SM
ALL"
301 PAUSE 200
302 CLS
303 GOTO 15
310 PRINT AT 10,0;"ANGLE TOO LA
RGE"
311 PAUSE 200
312 CLS
313 GOTO 15
1000 CLS
1001 PRINT "WELCOME TO THE FERRY
GLIDE INN"
1002 PRINT AT 5,2;">-(93)---(94)
-<"
1003 PRINT AT 6,4;"(98) U (95)";
TAB 20;"(2*9d)"
1004 PRINT AT 7,4;"(92 9r 1sP 9e
91)";TAB 20;"(2*1sP 96)"
1005 PRINT AT 8,5;"(98 1sP 95)";
TAB 20;"(2*1sP 98)"
1006 PRINT AT 9,5;"(98 1sP 95)";
TAB 20;"(2*1sP 97)"
1007 PRINT AT 10,5;"(98 sP 95)"
1008 PRINT AT 11,5;"(98 sP 95)"
1009 PAUSE 1E3
1010 CLS
1011 GOTO 10
1500 FOR I=0 TO 31
1501 PRINT AT 21-INT Y/2,31-I;"<
= "
1502 IF 32-I=INT (0.5*X) THEN GO
TO 1505
1503 IF INKEY$="S" THEN GOTO 151
8
1504 GOTO 1517
1505 CLS
1506 PRINT AT 5,5;"CAPSIZE"
1516 GOTO 200
1517 NEXT I
1518 RETURN
```

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Stand out in the crowd with a ZX-81 woolly hat

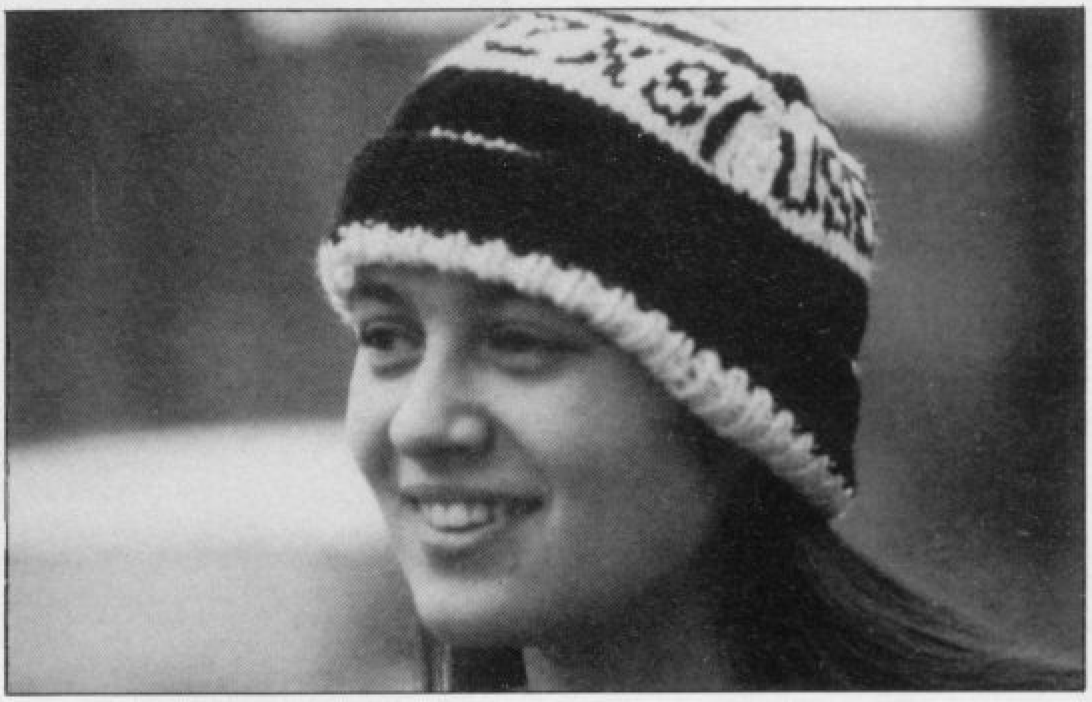
Celia Sims' computerised knitting pattern for a woolly hat has advantages over traditional charts

MOST SINCLAIR users are probably spending the cold, dark evenings huddled around their glowing TV screens while the sleet and rain rattle against the windows.

Celia Sims has used those hours to develop a practical use for her ZX-81, a computerised knitting pattern which produces an attractive woolly hat emblazoned with the message ZX-81 User.

She was the User of the Month in the July 1983 issue of *Sinclair User*. A seamstress by profession, she saw enormous potential in the ZX-81 for providing time-saving and entertaining knitting instructions.

She selected the design, colour and row length of the knitting pattern with the ZX-81 in mind and she believes that anyone, except possibly an absolute beginner at knitting, should be able to follow the pattern easily. Those who are unable to knit might have friends who could knit the hat for them.



There are many advantages of using computerised knitting patterns. As the instructions appear on the screen together with the pattern graphics, they are easier to follow than the normal printed charts from which the knitter has to count the stitches.

The pattern also acts as a row counter, and size adjustments are made automatically. Finally, as the graphics on purl rows are reversed, the current row of the pattern is always displayed the same way round as the knitting in one's hand. That is simpler than the normal printed charts, when the knitter has to read from right to left on knit rows and from left to right on purl rows.

The only disadvantages are in the setting-up and loading of the program—considerably less convenient than merely opening a pattern chart—and in the fact that the ZX-81 is less portable and requires an electricity supply, thus making knitting on the bus highly impracticable.

```
  10 REM "ZX81 USER HAT"
  11 PRINT AT 0,10;"ZX81 USER HA
T"
  12 PRINT AT 4,12;"MATERIALS"
  13 PRINT AT 5,5;"PATONS BEEHIV
E CHUNKY"
  14 PRINT AT 6,2;"1 BALL BLACK
AND 1 BALL WHITE"
  15 PRINT AT 7,4;"PAIR 5MM (NO6
) NEEDLES"
  16 PRINT AT 9,12;"TENSION"
  17 PRINT "16 STITCHES AND 22 R
OWS TO 10CM"
  18 PRINT AT 12,14;"SIZE"
  19 PRINT AT 13,7;"CHILD (50CM
CROWN)"
  20 PRINT AT 14,7;"ADULT (55CM
CROWN)"
  21 PRINT AT 16,5;"FOR CHILD SI
ZE PRESS C"
  22 PRINT AT 18,5;"FOR ADULT SI
ZE PRESS A"
  23 IF INKEY$="C" THEN GOTO 27
  24 IF INKEY$<>"A" THEN GOTO 23
  25 LET V=1
  26 GOTO 29
  27 LET V=0
  29 GOSUB 2000
  30 PRINT AT 2,10;"ABBREVIATION
S"
  31 PRINT AT 3,13;"K=KNIT"
  32 PRINT AT 4,13;"P=PURL"
  33 PRINT AT 5,10;"TOG=TOGETHER
"
  34 PRINT AT 6,8;"B=BLACK, W=WH
ITE"
  39 PRINT AT 8,4;"IF YOU REQUIR
E CASTING ON"
  40 PRINT AT 9,6;"INSTRUCTIONS
PRESS 0"
  50 PRINT AT 12,4;"IF NOT, PRES
S ROW NUMBER"
  60 PRINT AT 13,7;"REQUIRED (1
TO ";V+60;")"
  70 INPUT R
  80 IF R<=-1 THEN GOTO 70
  90 IF R>=62 THEN GOTO 70
 100 IF R<>0 THEN GOTO 200
 110 GOSUB 2000
 120 PRINT AT 10,0;"USING BLACK,
 CAST ON ";V*2+20;" STITCHES"
 130 GOSUB 2100
 140 LET R=1
 170 IF R/2<>INT (R/2) THEN LET
T$="K2 TOG"
 200 LET A$="1111111111000000000
0000000000011111111000000000000011
1100001111"
 210 DIM B$(14,23)
 220 IF R<=41 OR R>=48 THEN GOTO
 300
 230 GOTO 410
 300 IF R<>30 THEN GOTO 400
 305 GOSUB 2000
 310 GOSUB 2300
 320 PRINT AT 10,0;"USING WHITE
K1,P1 TO LAST STITCH"
 330 PRINT "PURL TWICE INTO LAST
 STITCH"
 340 PRINT AT 12,10;"(";V*2+21;"
 STITCHES)"
 350 GOTO 1970
 400 IF R<>41 THEN GOTO 600
 410 GOSUB 2000
 420 PRINT AT 9,2;"PATTERN INSTR
UCTIONS FOLLOW"
 421 PRINT AT 10,1;"BOTH COLOURS
 USED IN EACH ROW"
 422 PRINT AT 11,1;"TAKE SPARE Y
ARN LOOSELY ACROSS"
 424 PRINT AT 12,4;"WRONG SIDE O
F EACH ROW"
 430 PRINT AT 15,7;"FOR ""ZX81""
 PRESS Z"
 440 PRINT AT 17,7;"FOR ""USER""
 PRESS U"
 450 IF INKEY$="U" THEN GOTO 485
 460 IF INKEY$<>"Z" THEN GOTO 45
0
 465 CLS
 470 GOSUB 2500
 471 LET B$(7)="(2*sP 5*1sP sP 1
sP 3*sP 1sP 2*sP 2*1sP 2*sP 1sP
3*sP)"
 472 LET B$(6)="(6*sP 1sP 2*sP 1
```

Continued on page 64

Continued from page 63

```
sP:sP:1sP:2*sP:1sP:2*sP:1sP:sP:1
sP:3*sP)"
 473 LET B$(5)="(5*sP:1sP:3*sP:1
sP:sP:1sP:2*sP:1sP:2*sP:1sP:sP:1
sP:3*sP)"
 474 LET B$(4)="(4*sP:1sP:5*sP:1
sP:4*sP:2*1sP:2*sP:1sP:3*sP)"
 475 LET B$(3)="(3*sP:1sP:5*sP:1
sP:sP:1sP:2*sP:1sP:2*sP:1sP:sP:1
sP:3*sP)"
 476 LET B$(2)="(3*sP:1sP:6*sP:1
sP:sP:1sP:2*sP:1sP:2*sP:1sP:sP:1
sP:3*sP)"
 477~LET B$(1)="(2*sP:5*1sP:sP:1
sP:3*sP:1sP:2*sP:2*1sP:2*sP:1sP:
3*sP)"
 479 LET P$="""ZX81"""
 480 GOTO 500
 485 CLS
 490 GOSUB 2500
 491 LET B$(7)="(2*sP:1sP:2*sP:1
sP:sP:4*1sP:sP:4*1sP:sP:4*1sP:2*
sP)"
 492 LET B$(6)="(2*sP:1sP:2*sP:1
sP:sP:1sP:2*sP:1sP:sP:1sP:4*sP:1
sP:2*sP:1sP:2*sP)"
 493 LET B$(5)="(2*sP:1sP:2*sP:1
sP:sP:1sP:4*sP:1sP:4*sP:1sP:2*sP
:1sP:2*sP)"
 494 LET B$(4)="(2*sP:1sP:2*sP:1
sP:2*sP:2*1sP:2*sP:3*1sP:2*sP:3*
1sP:3*sP)"
 495 LET B$(3)="(2*sP:1sP:2*sP:1
sP:3*sP:2*1sP:sP:1sP:4*sP:1sP:2*
sP:1sP:2*sP)"
 496 LET B$(2)="(2*sP:1sP:2*sP:1
sP:sP:1sP:2*sP:1sP:sP:1sP:4*sP:1
sP:2*sP:1sP:2*sP)"
 497 LET B$(1)="(3*sP:2*1sP:2*sP
:4*1sP:sP:4*1sP:sP:1sP:2*sP:1sP:
2*sP)"
 499 LET P$="""USER"""
 500 FOR I=1 TO 7
 510 LET I$=""
 520 FOR J=23 TO 1 STEP -1
 530 LET I$=I$+B$(I,J)
 540 NEXT J
 550 LET B$(I+7)=I$
 560 NEXT I
 600 IF R<=40 OR R>=48 THEN GOTO
 900
 610 GOSUB 2000
 620 PRINT AT 2,9;"(";P$;" PATTE
RN)"
 630 GOSUB 2200
 640 GOSUB 2300
 650 LET X=R-40
 660 LET Y=0
 670 IF R/2=INT (R/2) THEN LET Y
=7
 700 FOR I=1 TO X
 710 PRINT AT 19-I,5;B$(I+Y)
 720 NEXT I
 722 PRINT AT 19-X,5-V;"*"
 724 PRINT AT 19-X,27+V;"*"
 730 LET C=0
 740 LET Z=0
 750 PRINT AT 6,2;S$
 755 PRINT AT 6,7;" ";
 760 FOR J=22+V TO 3-V STEP -1
 770 LET C=C+1
 780 IF B$(X+Y,J)=B$(X+Y,J-1) TH
EN GOTO 840
 790 IF Z=0 THEN LET C$="W,"
 800 IF Z<>0 THEN LET C$="B,"
 810 PRINT C;C$;
 820 LET C=0
 830 LET Z=NOT Z
 840 NEXT J
 845 LET C=C+1
 850 PRINT C;"W"
 860 GOTO 1970
 900 IF R<>V+59 THEN GOTO 1000
 910 GOSUB 2000
 920 GOSUB 2200
 930 GOSUB 2300
 940 GOSUB 2400
 950 PRINT AT 10,2;"USING ";C$;"
```



```
";T$;" ";S$;" 1"
 960 GOTO 1970
1000 IF R<>V+60 THEN GOTO 1200
1010 GOSUB 2000
1020 GOSUB 2300
1030 PRINT AT 10,12;"CAST OFF"
1040 GOSUB 2100
1050 CLS
1060 PRINT AT 9,2;"COMPLETE TWO
""ZX81"" SECIONS"
1070 PRINT AT 10,7;"AND TWO ""US
ER"" SECTIONS"
1080 PRINT AT 11,2;"ALTERNATING
""ZX81"" AND ""USER"""
1090 PRINT AT 12,2;"SECTIONS, JO
IN TO FORM HAT"
1095 PRINT AT 13,8;"AND SEW IN E
NDS"
1100 STOP
1200 IF R<=40 THEN GOTO 1400
1205 IF R=48 THEN GOTO 1230
1210 IF R>=55 THEN GOTO 1230
1220 IF R/2=INT (R/2) THEN GOTO
1400
1230 GOSUB 2000
1240 GOSUB 2400
1250 GOSUB 2300
1260 GOSUB 2200
1290 PRINT AT 10,8;"USING ";C$;"
";T$;","
1300 PRINT AT 11,0;S$;" TO LAST
2 STITCHES, ";T$
1310 GOTO 1970
1400 GOSUB 2000
1410 GOSUB 2400
1415 GOSUB 2300
1420 GOSUB 2200
1430 PRINT AT 10,0;"USING ";C$;"
";S$;" TO END OF ROW"
1970 GOSUB 2100
1980 LET R=R+1
1990 GOTO 300
2000 REM TITLE
2010 CLS
2011 IF V=0 THEN LET H$="-CHILD"
2012 IF V=1 THEN LET H$="-ADULT"
2020 PRINT AT 0,6;"""ZX81 USER""
 HAT";H$
2030 PRINT AT 1,6;"KNITTING INST
RUCTIONS"
2040 RETURN
2100 REM CONTINUE
2110 PRINT AT 20,4;"WHEN YOU HAV
E DONE THIS"
2120 PRINT AT 21,6;"PRESS C TO C
ONINUE"
2130 IF INKEY$<>"C" THEN GOTO 21
30
2140 RETURN
2200 REM STITCH
2210 IF R>=31 THEN GOTO 2240
2220 LET S$="K1,P1"
2230 RETURN
2240 IF R/2<>INT (R/2) THEN LET
S$="KNIT"
2242 IF R/2<>INT (R/2) THEN LET
T$="K2 TOG"
2245 IF R/2=INT (R/2) THEN LET T
$="P2 TOG"
2250 IF R/2=INT (R/2) THEN LET S
$="PURL"
2260 RETURN
2300 REM ROW
2310 PRINT AT 3,13;"ROW ";R
2320 RETURN
2400 REM COLOUR
2401 IF R=1 THEN GOTO 2410
2402 IF A$(R)=A$(R-1) THEN GOTO
2410
2403 IF A$(R-1)="0" THEN LET C$=
"WHITE"
2404 IF A$(R-1)<>"0" THEN LET C$
="BLACK"
2405 PRINT AT 10,7;"CUT OFF ";C$
;" YARN"
2406 PRINT AT 11,2;"SEW IN LATER
 WHEN MAKING UP"
2407 GOSUB 2100
2408 GOSUB 2000
2410 IF A$(R)="0" THEN LET C$="W
HITE"
2420 IF A$(R)<>"0" THEN LET C$="
BLACK"
2430 RETURN
2500 REM WAIT
2510 PRINT AT 11,4;"(PREPARING I
NSTRUCTIONS)"
2520 RETURN
```

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Addictive

*ZX81 Chart, Home Computing Weekly 16.8.83

Comments about the game from press and our customers

"FOOTBALL MANAGER is the best game I have yet seen on the Spectrum and my personal favourite of all the games on any micro ... To the ordinary person it is an excellent view of what can be done in the field of computer games ... The crowning glory of this game is the short set pieces of match highlights which show little stick men running around a pitch, shooting, defending and scoring ... It is a compulsive game but people who cannot take game sessions of 9 hours or so, which happened on one happy Sunday, will be grateful to know that there is a 'save to tape' option. FOOTBALL MANAGER has everything it could ... The originator, Addictive Games, certainly deserve the name." Rating: 19/20 (Practical Computing – August 1983).

"When I first received this game I spent the best part of the weekend playing it. Since then I have returned to it more often than any other. The truly addictive quality of this game is the remarkable way it mirrors the real football manager's problems ... "(Personal Computer Games – Summer 1983)

"It's my own fault you *did* warn me – I am totally and completely hooked on FOOTBALL MANAGER." (Mr. A. Wright – Lancashire.)

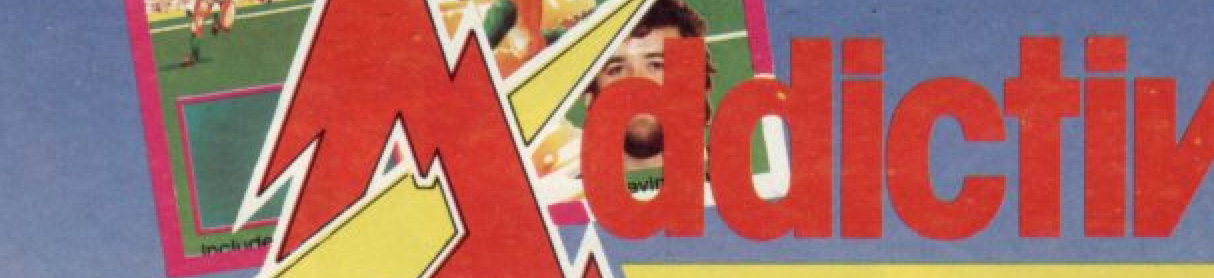
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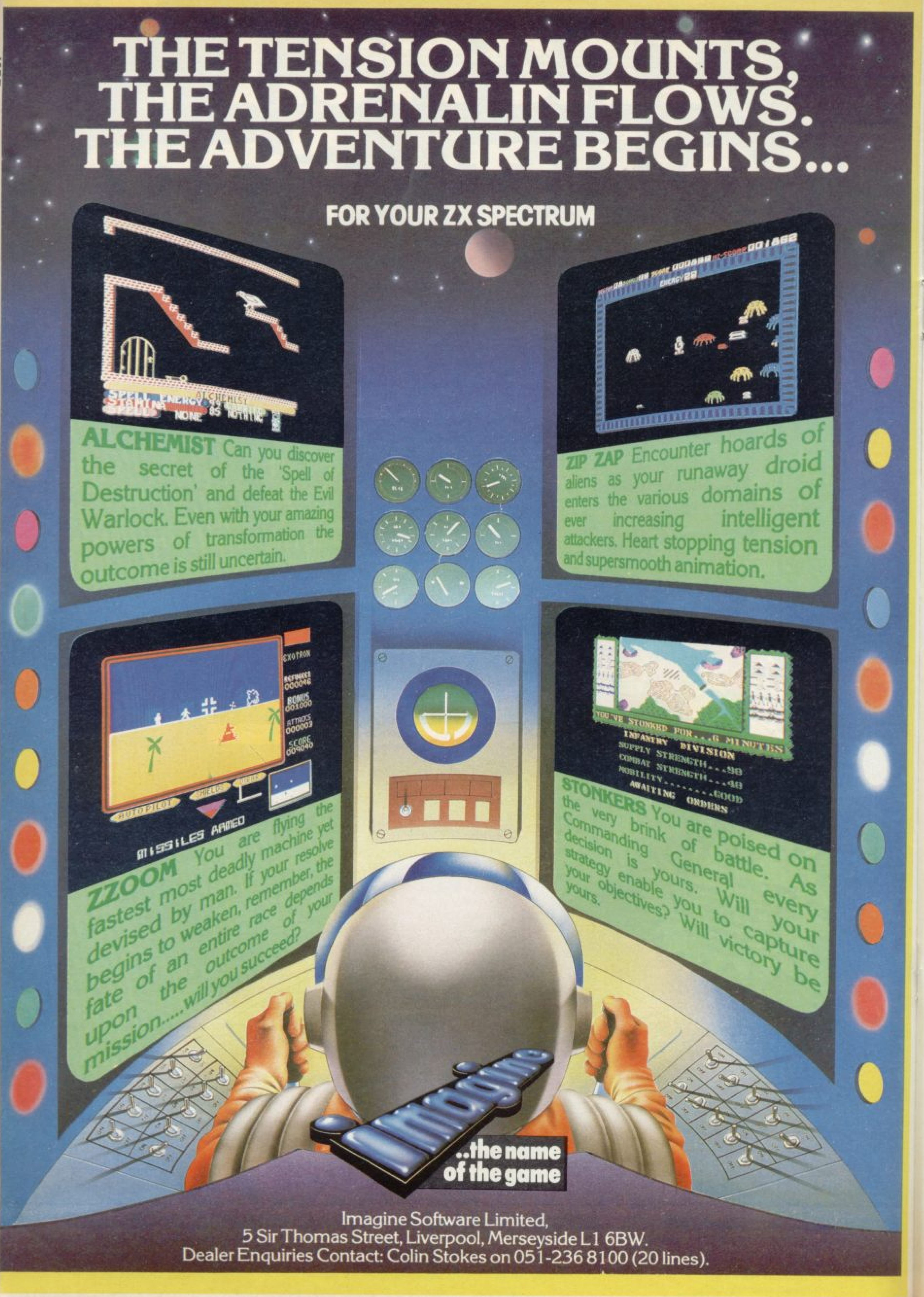
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- The program lists out, in order of preference, the sixteen most likely score-draws: also the sixteen most likely homes, draws and aways.
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48k

WIN THE POOLS?

SPECTADRAW 2 — THE BEST SELLING POOLS PREDICTION PROGRAM FOR THE 48K ZX SPECTRUM

The program looks at the recent form of the teams playing in each week's English and Scottish football league matches and then refers to a large database to see what has happened in the past when teams with similar form met. By combining the lessons learnt from the past with the teams' current league position, the program generates a draw probability factor for each match. It can then identify the matches which are likely to yield draws and output suitable predictions. It will also output the least likely draws for the benefit of those who prefer the fixed odds lines on coupons.

Program, 8000 match database (both on high quality cassette) and instruction manual £12.95 inclusive.

NEW!!! SPECTASORT — THE PERM GENERATION PROGRAM

Spectasort takes the 14 most likely and 10 least likely draw predictions and produces ten 8 from 10 full over perms, enabling you to complete your pools coupon directly from the screen. The program will run on its own in 16K, using your own predictions, or has the unique feature of being able to merge with SPECTADRAW 2 to provide a complete Pools Prediction package!!

Spectasort program on high quality cassette £4.95 inclusive.

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SPECTADRAW

1 Cowleaze, Chinnor, Oxford OX9 4TD



- **Solves storage problems**
- **Computer angled for convenient use**
- **Avoids lengthy setting up**
- **Hides most of wiring**
- **Case and console moulded in black grained ABS plastic**

Treetop Designs, 61 Widmore Road, Bromley. Kent. BR1 3AA.

£44.95 (plus p & p)

Smart executive type case, purpose built, with locks, special hinges and lift-off lid.

Internal console allows neat installation of computer, power supply and printer in fitted recesses. Provision for housing tape recorders up to 28cm x 15cm.

Aluminium switch panel eliminates constant removal of plugs for both save/load and power off facilities and provides sockets for tape recorder leads, to allow operation in convenient position shown.

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Please allow up to 28 days for delivery.

If you are not satisfied we shall of course refund your money, if you return the case undamaged within 14 days.

PROGRAM PRINTOUT

Instructions for graphics characters are printed in lower-case letters in our listings. They are enclosed by brackets and separated by colons to distinguish them and the brackets and colons should not be entered.

Inverse characters are represented by the letter "i" and graphics characters by "g". Thus an inverse W would be represented by "iw", a graphics W by "gw", and an inverse graphics W by "igw".

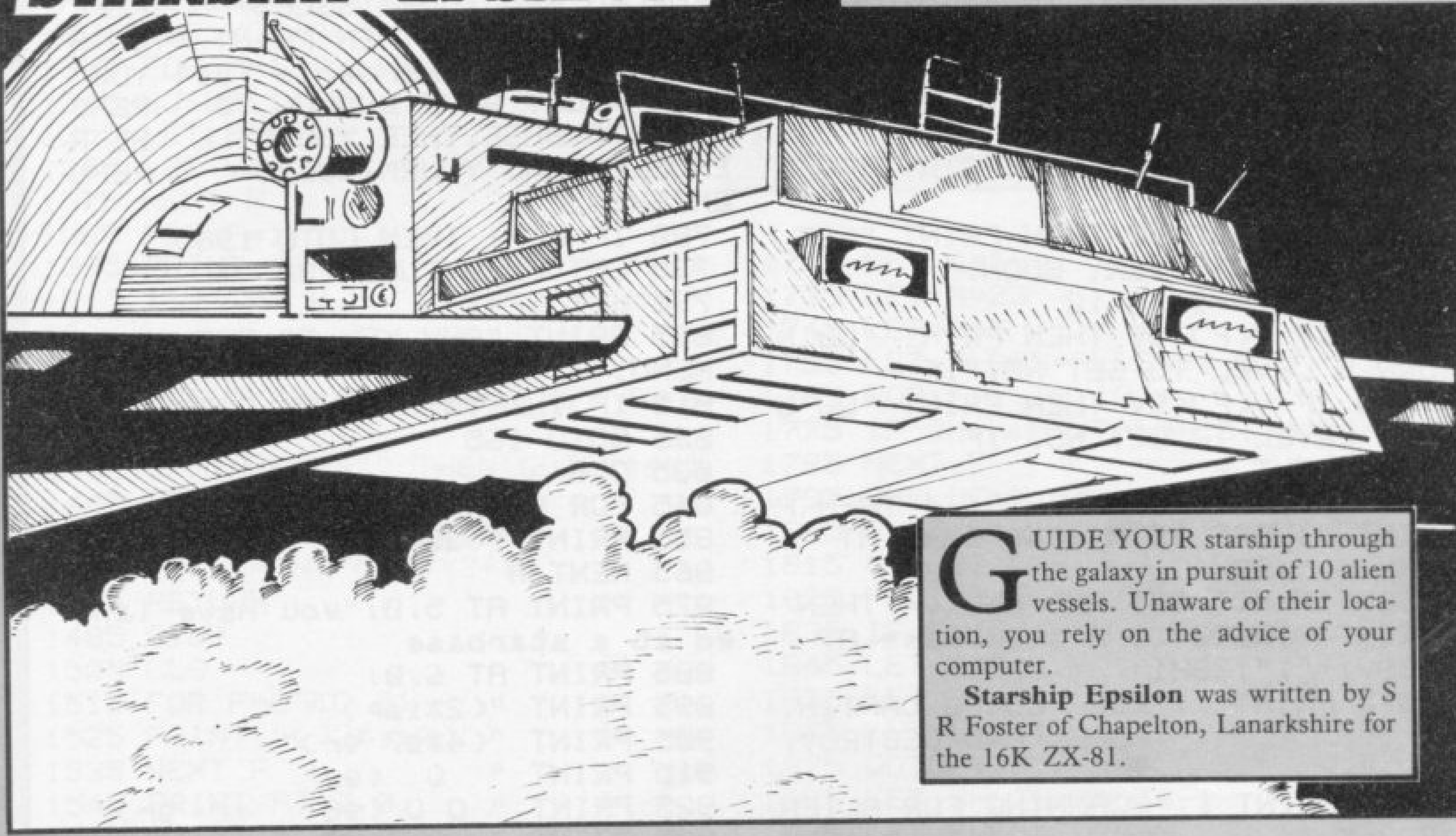
Spaces are represented by "sp" and inverse spaces by "isp". Whenever any character is to be used more than once, the number of times it is to be used is shown before it, together with a multiplication sign. Thus "6*isp" means six inverse spaces and "(g4:4*i4:g3)" would be entered as a graphic four, followed by an inverse four repeated four times, followed by a graphics three.

Where whole words are to be written in inverse letters they appear in the listings as lower-case letters. Letters to be entered in graphics mode on the Spectrum are underlined.

Inverse characters may be entered on the ZX-81 by changing to graphics mode and then typing the appropriate characters and on the Spectrum by changing to inverse video and typing the appropriate letters. Graphics characters may be entered on the ZX-81 by changing to graphics mode and then pressing symbol shift while the appropriate characters are entered. On the Spectrum graphics characters may be obtained by changing to graphics mode and then pressing the appropriate character. User-defined graphics will appear as normal letters until the program has been RUN.

STARSHIP EPSILON

STARSHIP EPSILON



GUIDE YOUR starship through the galaxy in pursuit of 10 alien vessels. Unaware of their location, you rely on the advice of your computer.

Starship Epsilon was written by S R Foster of Chapelton, Lanarkshire for the 16K ZX-81.

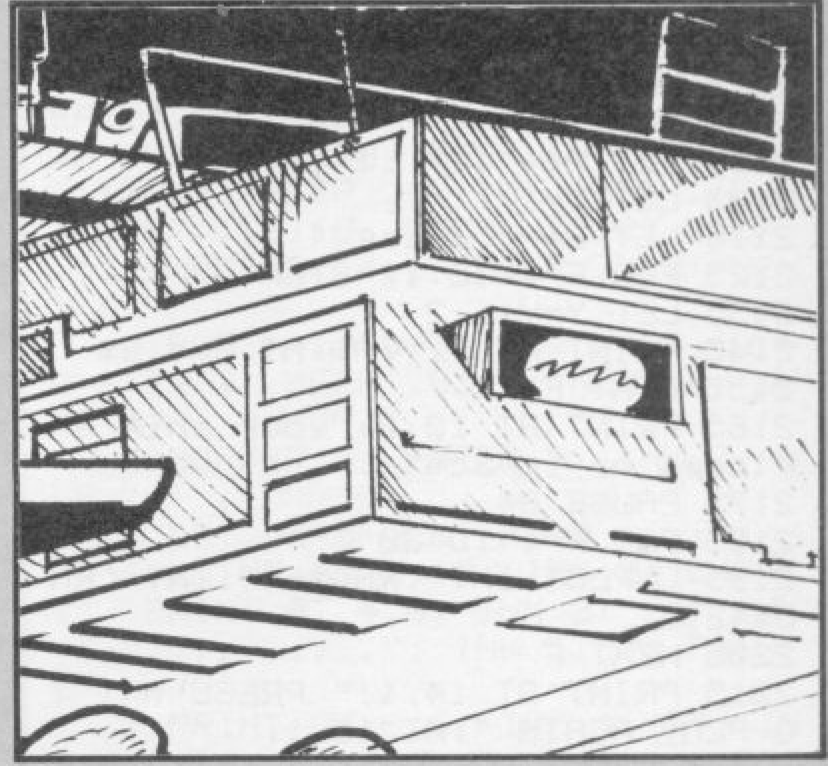
```
  5 LET SHOTS=50
 15 DIM H(10)
 25 DIM V(10)
 35 LET SB=0
 45 LET SB1=0
 55 LET EF=0
 65 LET FUEL=2500
 75 LET SV=2
 85 LET SH=50
 95 LET ALDES=0
105 LET SBH1=INT (RND*100)+1
115 LET SBV1=INT (RND*3)+1
125 LET SBV=INT (RND*3)+1
135 IF SBV=SBV1 THEN GOTO 125
145 LET SBH=INT (RND*100)+1
155 GOTO 1095
165 CLS
175 IF FUEL<=0 THEN GOTO 775
185 IF NOT SB AND SBH=SH AND SB
V=SV THEN GOTO 835
195 IF NOT SB1 AND SBH1=SH AND
SBV1=SV THEN GOTO 835
205 PRINT "SELECT ONE OF THE FO
LLOWING."
215 PRINT ,,"1. STATUS REPORT"
225 PRINT ,,"2. SHOOT"
235 PRINT ,,"3. THRUST"
245 PRINT ,,"4. ADVICE"
255 PRINT ,," INPUT YOUR CHOICE
(1-4)."
265 IF INKEY$="1" THEN GOTO 315
275 IF INKEY$="2" THEN GOTO 150
5
285 IF INKEY$="3" THEN GOTO 675
295 IF INKEY$="4" THEN GOTO 415
305 GOTO 265
```

Continued on page 70

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```
 315 CLS
 325 PRINT "          STATUS REPOR
T"
 335 PRINT "FUEL= ";FUEL;" UNITS
 LEFT."
 345 PRINT "AMMUNITION= ";SHOTS;
" LEFT."
 355 PRINT "ALIENS DESTROYED= ";
ALDES
 365 PRINT "HEIGHT LEVEL= ";SV
 375 PRINT "SECTION= ";SH
 385 PRINT ,,,,,,,"PRESS ANY KEY
TO RETURN ."
 395 IF INKEY$="" THEN GOTO 395
 405 GOTO 165
 415 CLS
 425 PRINT ,," MY AD VICE IS....
"
 435 IF FUEL<50 THEN PRINT "REFU
EL PRETTY SOON."
 445 IF SHOTS<2 THEN PRINT "GET
MORE BULLETS VERY SOON."
 455 FOR F=1 TO 10
 465 IF V(F)>SV THEN PRINT "GO D
OWN A LEVEL TO GET NO.";F
 475 IF V(F)<SV THEN PRINT "GO U
P A LEVEL TO GET NO.";F
 485 NEXT F
 495 IF NOT SB AND RND<.4 THEN P
RINT "THERE IS A star base AT ";
SBV;",";SBH
 505 IF NOT SB1 AND RND<.4 THEN
PRINT "THERE IS A star base AT "
;SBV1;",";SBH1
 515 PRINT ,,"KEEP GOING CAPTIN.
                SEEK AND DESTROY.
..."
 525 PRINT ,,"SCANNING FOR ALIEN
S..."
 535 FOR F=1 TO 10
 545 IF SV=V(F) THEN GOTO 575
 555 NEXT F
 565 GOTO 635
 575 FOR G=0 TO 5
 585 IF (SH+G=H(F)) OR (SH-G=H(F
)) THEN GOTO 615
 595 NEXT G
 605 GOTO 555
 615 PRINT "ARGHH THERE ARE ALIE
NS NEAR-BY.."
 625 GOTO 555
 635 PRINT ,,"PRESS ANY KEY TO C
ONTINUE..."
 645 IF INKEY$="" THEN GOTO 645
 655 GOTO 165
 675 CLS
 685 PRINT " TO CLIMB PRESS ""U"
""
 695 PRINT " TO DIVE PRESS ""D""
"
 705 PRINT " TO THRUST PRESS ""T
"""
 715 INPUT A$
 725 IF A$="U" THEN LET SV=SV-1
 735 IF A$="D" THEN LET SV=SV+1
 745 IF A$="T" THEN GOTO 2245
 755 IF A$="" THEN GOTO 715
 775 IF NOT EF THEN PRINT "YOU A
RE NOW USING emergence fuel YOU
JUST MIGHT HAVE ENOUGH TO   REAC
H A STARBASE.THEE YOU WILL  BE R
EFUELED AND YOURMISSLES     REPL
 775 IF NOT EF THEN PRINT "YOU A
RE NOW USING emergence fuel YOU
JUST MIGHT HAVE ENOUGH TO   REAC
H A STARBASE.THEE YOU WILL  BE R
EFUELED AND YOURMISSLES     REPL
ENISHED."
 780 IF EF=1 THEN GOTO 1985
 785 LET FUEL=FUEL+200
 795 LET EF=1
 805 PRINT "ANY KEY TO RETURN TO
MENU."
 815 IF INKEY$="" THEN GOTO 815
 825 GOTO 165
 835 CLS
 845 FOR A=0 TO 21
 855 PRINT "(30*isP)"
 865 NEXT A
 875 PRINT AT 5,0;"you have land
ed at a starbase
 885 PRINT AT 6,0;
 895 PRINT "(2*isP) "
 905 PRINT "(4*97:9r)"
 915 PRINT "  O (9y"
 925 PRINT " O O (98:      9r)"
 935 PRINT "  O (98:      99)"
 945 PRINT "      (9t:3*isP:io)"
 955 PRINT "(96:94:96:93:99:isP:
9t:isP)"
 965 PRINT "(2*isP:4*isP:9t:isP)
"
 975 PRINT "(8*isP:9t:isP)"
 985 PRINT "(5*isP)            "
 995 PRINT "(5*isP)            "
1005 PRINT "(5*isP)   FUEL     "
1015 PRINT "(5*isP)            "
1025 LET FUEL=FUEL+1500
1035 LET SHOTS=SHOTS+20
1045 PRINT "  any key to return
to menu
1055 IF SBH=SH AND SBV=SV THEN L
ET SB=1
1065 IF SBH1=SH AND SBV1=SV THEN
 LET SB1=1
1075 IF INKEY$="" THEN GOTO 995
```

```
1085 GOTO 165
1095 FOR F=0 TO 21
1255 FOR F=1 TO 100
1265 NEXT F
1275 CLS
1285 PRINT " ******STARSHIP EPS
ILON****** "
1295 PRINT ,,,," YOUR MISSION IS
 TO SEEK AND     DESTROY 10 ALIEN
 SPACESHIPS IN  YOUR GALAXY."
1305 PRINT ,," TO HELP YOU,YOU H
AVE A COMPUTER        ME."
1315 PRINT ,," I CAN TELL YOU OF
 ANY ALIENS IN YOUR AREA,ADVISE
YOU GIVE YOU A STATUS REPORT."
1335 FOR F=1 TO 10
1345 GOSUB 1455
1355 LET H(F)=X
1365 LET V(F)=Y
1375 NEXT F
1385 FOR F=1 TO 7
1395 PRINT AT 0,F;"(i )";AT 0,23
+F;"(i )";AT 0,F;"*";AT 0,23+F;"
*"
1405 NEXT F
1415 PRINT AT 17,2;"ANY KEY TO S
TART."
1435 IF INKEY$="" THEN GOTO 1435
1445 GOTO 165
1455 LET X=INT (RND*100)
1465 LET Y=INT (RND*3+1)
1475 RETURN
1485 STOP
1505 CLS
1515 FOR F=0 TO 21
1525 PRINT "(33*isP)"
1535 NEXT F
1545 PRINT AT 7,0;
1555 PRINT "(3*isP:i))"
1565 PRINT "(5*97:9r)"
1575 PRINT "      (7*97:i):i=:i-)
"
1585 PRINT "(14*96:99)"
1595 PRINT "    (98)"
1605 PRINT "   (93:99)"
1615 IF FUEL<=100 THEN PRINT "YO
U HAVE NO ENERGY TO SHOOT."
1625 IF FUEL<=0 THEN GOTO 105
1635 IF SHOTS<=0 THEN PRINT "YOU
 HAVE NO AMMO. LEFT."
1645 IF FUEL<=0 THEN GOTO 105
1655 FOR F=12 TO 26
1665 PRINT AT 9,F;"(i):i=:i-)"
1675 FOR G=1 TO 2
1685 NEXT G
1695 PRINT AT 9,F;"(3*isP)"
1705 NEXT F
1715 GOSUB 1885
```



```
1725 LET G=56
1735 LET A=23
1745 LET B=A
1755 LET ALDES=ALDES+1
1765 FOR F=1 TO 10
1775 IF SH=H(F) THEN LET H(F)=0
1785 NEXT F
1795 UNPLOT G,A
1805 PLOT G,A
1815 UNPLOT G,B
1825 PLOT G,B
1835 IF A=43 THEN GOTO 165
1845 LET A=A+1
1855 LET B=B-1
1865 LET G=G-1
1875 GOTO 1795
1885 LET SHOTS=SHOTS-1
1895 LET FUEL=FUEL-5
1905 FOR F=1 TO 10
1915 IF H(F)=SH AND V(F)=SV THEN
 RETURN
1925 NEXT F
1935 CLS
1945 PRINT "        missed"
1955 GOTO 175
1985 REM **NO FUEL**
1995 FOR F=0 TO 21
2005 PRINT AT F,0;"(30*isP)"
2015 NEXT F
2025 PRINT AT 0,0;"your ship mak
es a sudden plunge          downw
ards"
2035 LET Q$="00510152025203530 45
4055406550656065707570858095909 6
01060116012611361146216 63"
2045 FOR F=1 TO LEN Q$ STEP 4
2055 LET X=VAL Q$(F TO F+1)
```

Continued on page 72

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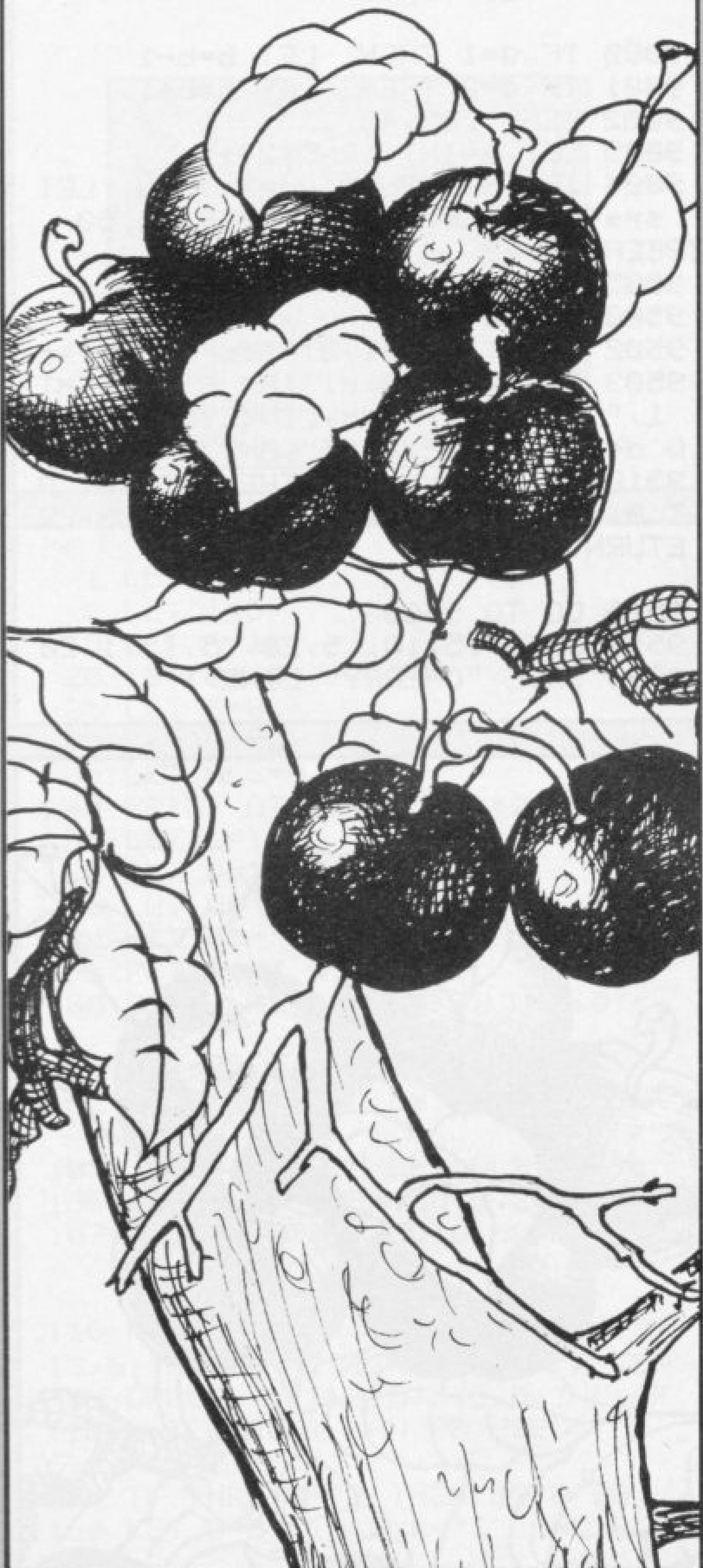
```
2065 LET Y=VAL Q$(F+2 TO F+3)
2075 UNPLOT Y,X
2085 NEXT F
2095 LET A$="(i) i= i -)"
2105 LET Y=1
2115 LET B$="(3*isP )"
2125 FOR F=1 TO 17 STEP .7
2135 LET Y=Y+1.2
2145 PRINT AT F,Y;A$;AT F,Y;B$
2155 NEXT F
2165 PRINT AT 10,2;"your ship ex
plodes on impact"
2175 PAUSE 84
2185 FOR F=1 TO 30
2195 UNPLOT INT (RND*64),INT (RN
D*42)
2205 NEXT F
2215 PRINT AT 14,1;" PRESS n\l T
O PLAY AGAIN ";AT 15,1;"
                         "
2225 INPUT I$
2235 RUN
2245 CLS
2255 PRINT "PRESS ""F"" TO GO FO
RWARD          PRESS ""B"" TO GO
BACK WARDS      IF YOU PRESS ANY
THING ELSE YOU  WILL THEN RETURN
 TO THE MENU."
2265 PRINT "  TO STOP THRUSTING,
RELEASE THE  KEY."
2275 IF INKEY$="" THEN GOTO 2275
2285 IF INKEY$="B" THEN GOTO 231
0
2295 IF INKEY$="F" THEN GOTO 250
0
2305 GOTO 165
2310 CLS
2315 FOR F=1 TO 21
2325 PRINT "(32*isP )"
2335 NEXT F
2345 PRINT AT 10,0;
2355 PRINT "(18*isP 3*97 i< i= 3
*97 9r )"
2365 PRINT "(13*isP i< i=       W
19    98)"
2375 PRINT "(14*isP ============
=====isP )"
2385 PRINT "(6*isP i/ isP 99 isP
 i-               99 )"
2395 PRINT "(5*isP 97 ..........
.EPSILON.....99)"
2405 PRINT "(3*isP 97
  9a 10*9s )"
2415 PRINT "(8*isP 9w            9a
8*9d )"
2425 PRINT "(4*isP 9e 10*97 )     "
2435 PRINT "(4*isP 9w 21*96 99 )"
2445 PRINT AT 16,25;"(2*i*)";AT
16,25;"(2*isP )"
2455 IF INKEY$<>"B" THEN GOTO 16
5
2465 LET SH=SH-1
2475 IF SH=0 THEN LET SH=100
2485 LET FUEL=FUEL-10
2490 IF FUEL<=0 THEN GOTO 775
2495 GOTO 2445
2500 CLS
2505 FOR F=1 TO 21
2515 PRINT "(31*isP )"
2525 NEXT F
2535 PRINT AT 10,0;
2545 PRINT "(5*isP 9e 3*97 i= i)
 3*97 )"
2555 PRINT "(3*isP 98:        W19
   i= i))"
2565 PRINT "isP ================
="
2575 PRINT "(9w
   i- isP 99 isP i))"
2585 PRINT "(2*isP.....EPSILON..
..........97)"
2595 PRINT "(5*isP 9*9d 9a
       97 )"
2605 PRINT "(7*isP 8*9d 9a
   93)"
2615 PRINT "(14*isP     10*97)"
2625 PRINT "(3*isP 9w 24*96 )"
2635 PRINT AT 16,5;"(2*i*)";AT 1
6,5;"(2*isP )"
2645 IF INKEY$<>"F" THEN GOTO 16
5
2655 LET SH=SH+1
2665 LET FUEL=FUEL-10
2675 IF SH>100 THEN LET SH=1
2685 IF FUEL<=0 THEN GOTO 775
2695 GOTO 2635
2700 SAVE "Se"
2710 RUN
```



cherry swipe

AIM YOUR ball at the over-hanging branches of the cherry tree. If you are accurate you will score. There are also bonus points to be gained as you throw your ball through the farmer's fence.

Cherry Swipe was written by Barry Webber, aged 14, of Morden, Surrey for the 16K Spectrum.



```
  1 BRIGHT 0
  2 FOR f=1 TO 2: BEEP .3,1: BE
EP .4,10: BEEP .15,12: BEEP .12,
10: BEEP .12,8: BEEP .3,10: BEEP
 .15,12: BEEP .12,10: BEEP .12,8
: BEEP .12,10: BEEP .12,8: BEEP
.15,6: BEEP .4,1: BEEP .5,8: NEX
T f
  3 FOR n=1 TO 3: FOR f=30 TO 4
0 STEP 2: BEEP .01,f: NEXT f: NE
XT n
  4 BORDER 0: PAPER 0: INK 7: C
LS
  5 LET vc=5: LET hi=0
  6 PRINT AT 0,13; INK 2;"CHERR
Y": PRINT AT 4,6; INK 2;"c"; INK
 6;"..........."; INK 5;"20 POINT
S"
  7 PRINT AT 6,6; INK 4;"a"; IN
K 6;"......"; INK 5;"Mystery POI
NT"
  8 PRINT AT 8,0;"The man at th
e top of the screenis moved by k
eys 5 and 8.When heis in line wi
th a cherry Press 7"''"The objec
t is to score as many  Points as
 you can.The screen     will chan
ge colour after 500     Points.As
 the game Progresses    you will
need more Points to     get in to
 the next 'ROUND'."
  9 PRINT AT 20,7; FLASH 1;"ANY
 KEY TO CONTINUE"
 20 PAUSE 0: BEEP .2,6: BEEP .2
,12
 23 FOR f=USR "a" TO USR "e"+7:
 READ x: POKE f,x: NEXT f
 24 DATA 255,255,195,219,219,19
5,255,255
 25 DATA 60,126,255,255,255,255
,126,60
 26 DATA 16,8,24,116,119,119,7,
0
 27 DATA 24,60,24,255,24,24,36,
66
 28 DATA 24,60,24,60,90,153,36,
66
 29 REM Run before typing more
 30 LET a$="a a a a a a a a a a
 a a a a a a"
 34 LET fh=60
 35 LET aa=4: LET bb=6: LET cc=
13
 36 LET dd=0: LET zz=0
 37 LET sc=0: LET s=0
 39 LET r=1
 40 LET rs=60
 41 FOR h=1 TO vc: CLS
 42 FOR f=3 TO 17 STEP 4: BEEP
.01,f+10: PRINT  INK aa; BRIGHT
```

```
1;AT f,0;a$: PRINT  INK bb; BRIG
HT 1;AT f+2,1;a$: NEXT f
  44 FOR f=1 TO cc
  45 LET ee=INT (RND*31)+1: PRIN
T AT 19,ee; INK 2;"c": NEXT f
  49 GO SUB 9500
  50 LET a=1: LET b=d+1
  55 LET g=INT (RND*2)+1
  80 IF b<1 THEN  LET b=0
  81 IF b>30 THEN  LET b=31
  82 PRINT AT a,b;"b"
  83 IF sc+s>=500 AND dd=0 THEN
 FOR f=1 TO 5: FOR p=40 TO 30 ST
EP -1: BEEP .01,p: NEXT p: NEXT
f: PRINT AT 21,0;"Score="; FLASH
 1;"500": FOR f=1 TO 10: BEEP .1
,-5: BEEP .1,-10: NEXT f: PRINT
AT 21,0;"Score=500": LET aa=3: L
ET bb=5: LET cc=8: LET dd=1: LET
 fh=65: LET vc=4
  84 IF sc+s>=1000 AND zz=0 THEN
 FOR i=1 TO 2: FOR f=1 TO 10: B
EEP .05,f: BEEP .01,-f: NEXT f:
NEXT i: BEEP .8,-10: LET fh=70:
LET zz=1
  85 BEEP .06,-10: PRINT AT a,b;
" ": BEEP .06,-20
  89 IF ATTR (a+2,b)=2 THEN  RES
TORE 9516: FOR f=1 TO 4: READ j,
k: BEEP j,k: NEXT f: GO SUB 5000
  90 LET a=a+1: IF SCREEN$ (a+1,
b)="" THEN  GO SUB 9000
  91 PRINT AT 21,0;"Score=";s+sc
  99 IF a>18 THEN  GO TO 101
 100 GO TO 80
 101 FOR f=40 TO 30 STEP -1: BEE
P .01,f: NEXT f: NEXT h
 103 IF sc+s>=rs THEN  GO TO 510
0
 110 CLS
 111 BRIGHT 1
 112 BEEP .5,4: BEEP .5,4: BEEP
.5,4: BEEP .8,0
 120 PRINT AT 2,0; INK 6; BRIGHT
 0; FLASH 1;" Your Score is:"
 140 INK 4: PRINT AT 7,10;sc;" F
or cherries": PRINT AT 8,9;"+";s
;" For Squares"
 150 PRINT AT 9,10;"-----------
--": PRINT AT 10,10;s+sc;"=Total
": INK 6: PRINT AT 14,0;" You
 needed ";rs;" to get into ": PR
INT AT 16,8;" Round Number '";r+
1;"'"
 164 IF s+sc>hi THEN  LET hi=s+s
c
 165 INK 4: PRINT AT 19,5;"Today
s Highest:";hi
 169 INPUT  INK 6;"PRESS ENTER T
O PLAY AGAIN ";z$
 171 BEEP .1,-10: INK 7: BRIGHT
0
 172 GO TO 30
5000 FOR f=1 TO 20: PRINT AT 21,
0;"Score=";s+sc: LET sc=sc+1: BE
EP .07,f+20: NEXT f: RETURN
5100 LET r=r+1: LET rs=rs+fh: PR
INT AT 21,10;"  Round "; FLASH 1
;r: BEEP 1,-20: BEEP 1,-25: PRIN
T AT 21,10;"  Number to beat=";
FLASH 1;rs: BEEP 1,-20: BEEP 1,-
25: PRINT AT 21,10;"
    ": GO TO 41

9000 IF g=1 THEN  LET b=b-1
9001 IF g=2 THEN  LET b=b+1
9002 BEEP .05,40
9003 LET g=INT (RND*2)+1
9004 IF INT (RND*10)=5 THEN  LET
 s=s+1: BEEP .2,40: BEEP .2,50:
BEEP .2,40
9005 RETURN
9500 LET d=15
9502 PRINT AT 21,0;"Score=";s+sc
9503 PRINT AT 0,d; INK 6; BRIGHT
 1;" d ": LET d=d+(INKEY$="8" AN
D d<30)-(INKEY$="5" AND d>1)
9510 IF INKEY$="7" THEN  PRINT A
T 0,d; INK 6;" e": BEEP .1,30: R
ETURN

9515 GO TO 9503
9516 DATA .5,10,.5,20,.5,15,1,20
9999 SAVE "CHERRY" LINE 1
```



SPACE ZOMBIES

SPACE ZOMBIES was written for the 16K ZX-81 by Stuart Cockling of Hemel Hempstead, Herts. Shoot the aliens before they reach earth. As one alien cannot kill you it waits until two of its companions manage to pass you. When that happens their combined forces can kill you and you lose a life. You have a teleporter pack which you may use eight times. Use "5" for left, "8" for right, "7" for fire and "6" to teleport.

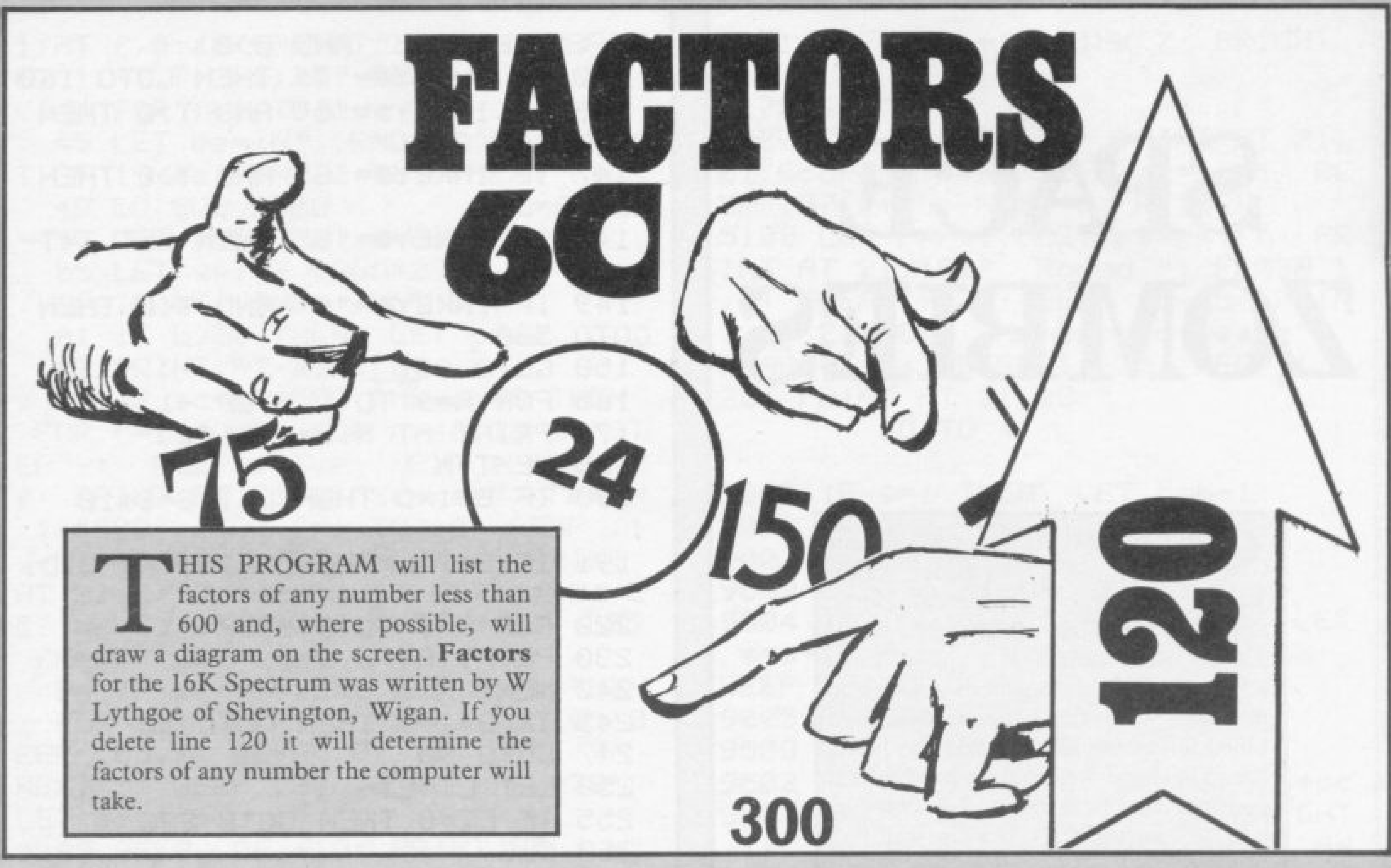
```
  1 LET HS=0
  2 LET T=8
 10 LET A=10
 20 LET B=14
 25 LET S=0
 30 LET LI=3
 35 LET ALS=0
 40 PRINT AT 11,0;"(29*9a)"
 50 LET C=1
 60 LET D=INT (RND*30)+1
 70 LET A$=" O "
 80 LET B$="z"
 90 PRINT AT A,B;A$
100 PRINT AT C,D;B$;AT C-1,D;"
"
101 LET C=C+1
102 PRINT AT C,D;B$;AT C-1,D;"
"
105 IF C=11 THEN LET ALS=ALS+1
106 IF ALS=3 THEN GOTO 250
107 IF C=11 THEN GOTO 50


110 PRINT AT 12,6;"SCORE:";S;AT
 13,6;"LIVES:";LI;AT 14,3;"ALIEN
S ON GROUND:";ALS;AT 15,0;"NO.OF
 TIMES TELEPORT CAN BE USED";AT
16,9;"""";T;""""
120 IF INKEY$="" THEN GOTO 90
130 LET B=B+(INKEY$="8" AND B<2
9)-(INKEY$="5" AND B>0)
140 IF INKEY$="7" THEN GOTO 160
145 IF INKEY$="6" AND T>0 THEN
PRINT AT A,B;"   "
147 IF INKEY$="6" AND T>0 THEN
LET B=D-1
148 IF INKEY$="6" THEN LET T=T-
1
149 IF INKEY$="6" AND T<0 THEN
GOTO 500
150 GOTO 90
160 FOR N=9 TO C STEP -1
170 PRINT AT N,B+1;"(9a)"
180 NEXT N
190 IF B+1=D THEN LET S=S+10

191 IF B+1=D THEN PRINT AT C,D;
" "
220 FOR N=9 TO C STEP -1
230 PRINT AT N,B+1;" "
240 NEXT N
245 IF B+1=D THEN GOTO 50
247 GOTO 90
250 LET LI=L1-1
255 IF LI=0 THEN GOTO 280
260 CLS
270 GOTO 35
280 CLS
290 PRINT "YOU ARE DEAD"
300 PRINT "PRESS A KEY TO SEE T
HE INVASION"
305 IF INKEY$="" THEN GOTO 305
310 CLS
320 LET Z$="(31*iz)"
330 FOR N=1 TO 20
340 PRINT AT 21,0;"(30*9a)"
350 PRINT AT N,0;Z$;AT N-1,0;"
                                "

360 NEXT N
370 PRINT AT 0,0;"THE INVASION
HAS BEEN SUCCESSFULPLANET EARTH
IS NOW UNDER............zombie..
........................CONTROL"
380 IF S>HS THEN LET HS=S
390 PRINT "     HIGH SCORE:";HS
400 IF INKEY$="" THEN GOTO 400
410 CLS
420 GOTO 2
500 FOR N=1 TO 10
510 PRINT AT A,B+1;"(io)";AT A,
B+1;"O";AT A,B+1;"."
520 NEXT N
530 PRINT AT A,B;"   "
540 PRINT AT 0,0;"YOU TRIED TO
OVER USE THE        TELEPORT.YOU
EXPLODED INTO       MILLIONS OF B
ITS"
550 IF INKEY$="" THEN GOTO 550
560 GOTO 310
```

FACTORS

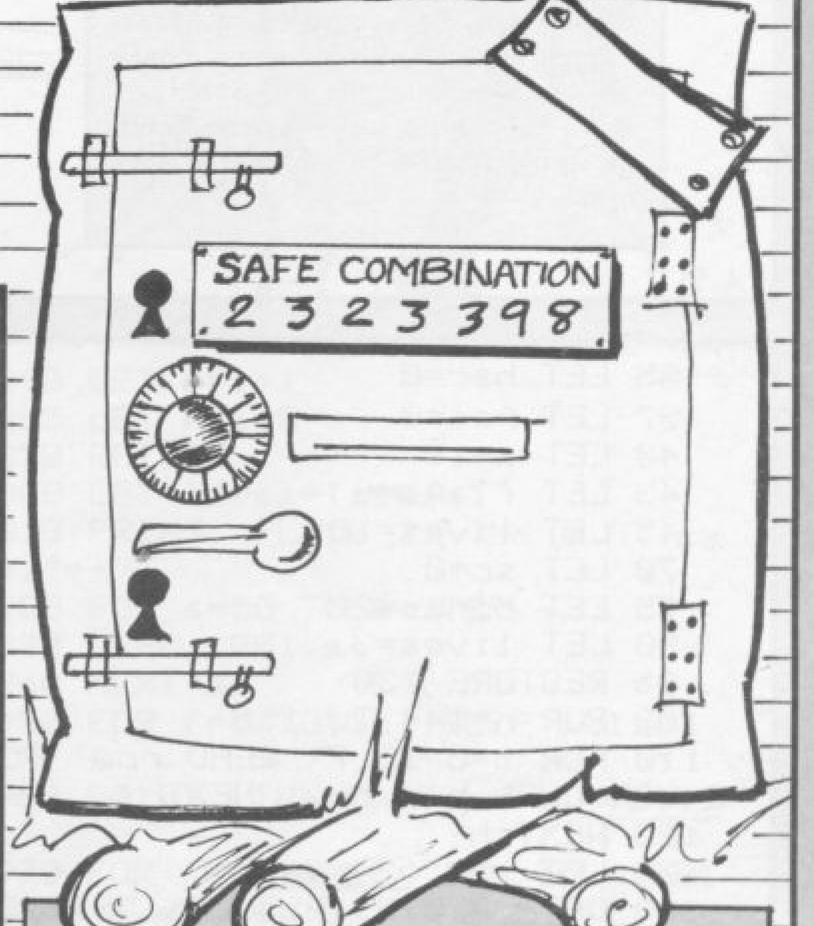


THIS PROGRAM will list the factors of any number less than 600 and, where possible, will draw a diagram on the screen. **Factors** for the 16K Spectrum was written by W Lythgoe of Shevington, Wigan. If you delete line 120 it will determine the factors of any number the computer will take.

```
  30 GO SUB 500
  40 BORDER 1: PAPER 1: INK 7: C
LS
  50 CLS
  60 PRINT ''" INPUT any number
up to 600          and I will tell y
ou its             factors."
  65 FOR n=1 TO 8: LET m=12+RND*
12: BEEP .1,m: BEEP .2,m: NEXT n
: PAUSE 100
  70 PRINT ''" If it will fit on
 my screen I    will draw you a p
icture of it."
  75 FOR n=1 TO 8: LET m=12+RND*
12: BEEP .1,m: BEEP .2,m: NEXT n
  90 LET x=0
  95 INPUT a
 100 IF INT a<>a THEN  PRINT ''"
it only works with whole
 numbers!": GO TO 95
 105 CLS
 110 PRINT a
 115 PAUSE 100
 120 IF a>600 THEN  PRINT "Too b
ig. INPUT 600 or less.": GO TO 9
5
 130 FOR b=2 TO INT (a/2)
 140 LET c=a/b
 150 IF c=INT c AND c<=31 AND b<
=20 AND c<>1 THEN  GO SUB 200
 160 IF c=INT c AND c<>1 THEN  G
O SUB 300
 180 NEXT b
 190 IF x=0 THEN  PRINT ; FLASH
1;"       ";a;" is a prime number.
"
 192 PRINT ''"            To stop pr
ess s.          "''"For another go
press any key."
 194 PAUSE 0
 196 IF INKEY$="s" THEN  STOP
 198 GO TO 50
 200 CLS
 210 FOR m=1 TO b
 220 FOR n=1 TO c
 230 PRINT AT m,n; INK 6;"a"
 240 BEEP .05,n
 250 NEXT n
 260 NEXT m
 270 PAUSE 100
 280 RETURN
 300 PRINT c;" x ";b;" = ";a
 310 BEEP 2,1
 320 LET x=x+1
 330 RETURN
 500 FOR n=0 TO 7: READ z
 510 POKE USR "a"+n,z
 520 NEXT n
 530 DATA 0,BIN 01111110,BIN 011
11110,BIN 01111110,BIN 01111110,
BIN 01111110,BIN 01111110,0
 540 RETURN
 600 RUN
```

BANK VAULT

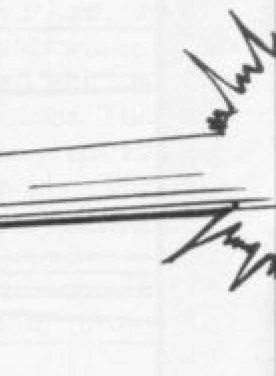





```
 10 DIM A(21,21)
 20 FOR I=0 TO 8 STEP 2
 30 FOR J=I+1 TO 21-I
 40 LET A(I+1,J)=128
 50 LET A(21-I,J)=128
 60 LET A(J,I+1)=128
 70 LET A(J,21-I)=128
 80 NEXT J
 90 NEXT I
100 LET A(3,11)=0
110 LET A(7,11)=0
120 LET A(13,11)=0
130 LET A(17,11)=0
140 LET A(11,11)=140
200 PRINT
210 FOR I=1 TO 21
220 PRINT " ";
230 FOR J=1 TO 21
240 PRINT CHR$ A(I,J);
250 NEXT J
260 PRINT
270 NEXT I
300 LET M=1500
310 PRINT AT 11,22;"£";M
320 LET L=20
330 LET C=11
332 PRINT AT L,C;"O"
336 PAUSE 500
340 PRINT AT L,C;"O"
350 LET M=M-10
355 IF M<0 THEN GOTO 600
356 IF M<100 THEN PRINT AT 10,2
2;"HURRY"
360 PRINT AT 11,23;M;"  "
370 LET N=CODE INKEY$-28
380 IF N<5 OR N>8 THEN GOTO 350
390 LET LI=L-(N=7)+(N=6)
400 LET CI=C+(N=8)-(N=5)
410 IF A(LI,CI)=140 THEN GOTO 5
00
420 IF A(LI,CI)<>0 THEN GOTO 35
0
425 PRINT AT L,C;" "
430 LET L=LI
440 LET C=CI
450 GOTO 340
500 PRINT AT 10,22;"YOU GOT"
510 STOP
600 PRINT AT 10,22;"TOO SLOW"
```

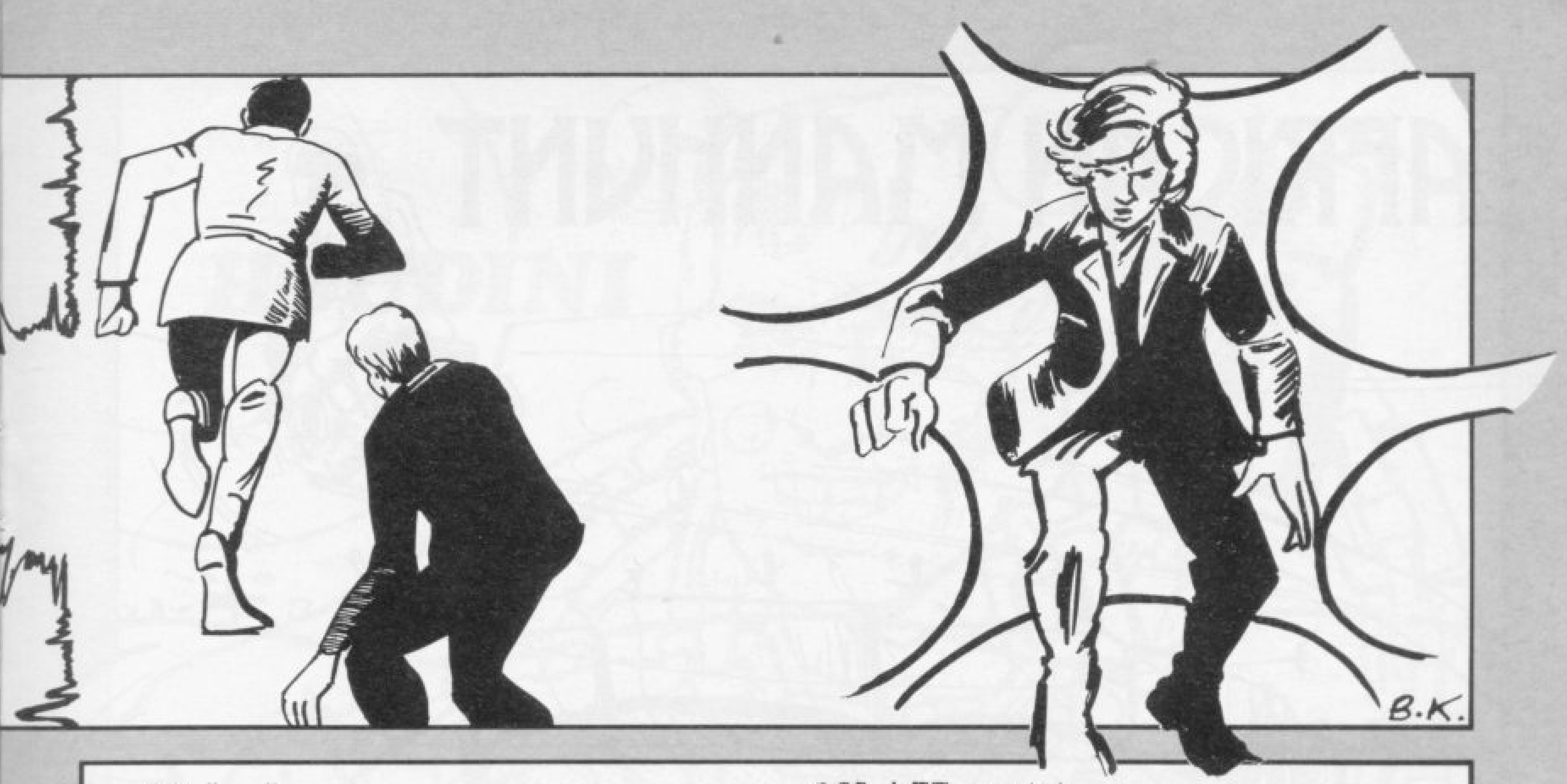
GUIDE YOURSELF round the maze using the cursor keys to save the money which is on fire in the central vault. **Bank Vault** is for the 16K ZX-81 by A Manser of St Albans, Herts.

LASER TOWER



H HANSEN, aged 15, of Aabenraa, Denmark wrote **Laser Tower** for the 48K Spectrum. It is a fast-moving zap-'em game. Shoot the intruder before he reaches your laser tower.

```
  35 LET hsc=0
  37 LET psi=0
  40 LET a=10
  43 LET flaps=0
  45 LET lives=10
  70 LET sc=0
  75 LET bonus=20
  80 LET lives=3
  95 RESTORE 130
 100 FOR h=144 TO 150
 110 FOR n=0 TO 7: READ row: POK
E USR CHR$ h+n,row: NEXT n
 120 NEXT h
 125 LET a$="(24*9e)"
 130 DATA 0,0,39,255,255,39,0,0
 140 DATA 7,31,191,255,255,191,3
1,7
 150 DATA 3,15,30,63,255,25,14,0
 160 DATA 192,240,248,252,255,15
2,112,0
 165 DATA 0,0,0,255,255,0,0,0
 166 DATA 17,68,1,25,78,8,82,9
 167 DATA 32,68,17,128,60,0,66,1
7
 170 CLS : PAPER 0: BORDER 0
 175 LET ink=INT (RND*4)+4
 180 FOR q=81 TO 0 STEP -1
 190 PLOT  INK ink;q,0: DRAW  IN
K ink; OVER 1;253-q+2,175
 195 NEXT q
 200 PRINT  INK 9; FLASH 0;AT 0,
1;"INSTRUCTIONS PRESS (y or n)"
 210 IF INKEY$="y" OR INKEY$="Y"
 THEN  GO TO 250
 220 IF INKEY$="n" OR INKEY$="N"
 THEN  GO TO 290
 230 GO TO 210
 250 CLS : PAPER 0: INK 7: PRINT
 AT 0,6;"(9c:9d)     Laser tower
 (9a:9b)"
 260 PRINT AT 2,0;" The object o
f the game is to   stop the inva
der (9c:9d) before it gets to th
e Laser tower. You've got 3 live
s. Every time an inva-der reache
s the tower you will  die."
 270 PRINT AT 9,0;" 6-Up      7-Do
wn     0-Fires"
 280 PRINT AT 11,4;"GOOD LUCK!";
AT 13,1;" Made by Henrik R. Hans
en";AT 21,0;"Press any key to co
ntinue"
 290 PAUSE 0
 305 BORDER 0
 310 FOR f=0 TO 21: PRINT  INK 0
;AT f,0;"(32*isp)": NEXT f
 320 FOR f=0 TO 21: PRINT  INK 2
;AT f,26;"(6*isp)": NEXT f
 330 PRINT  PAPER 2; INK 9;AT 4,
28;"L";AT 5,28;"A";AT 6,28;"S";A
T 7,28;"E";AT 8,28;"R";AT 12,28;
"T";AT 13,28;"O";AT 14,28;"W";AT
 15,28;"E";AT 16,28;"R"
 340 PRINT  INK 5;AT 0,7;"HI-SCO
RE:";hsc
 345 FOR j=1 TO 300: NEXT j: PRI
NT  INK 0;AT 0,7;"(18*isp)"
 350 PRINT  INK 6;AT 21,1;"SCORE
:";sc
 355 PRINT  INK 6;AT 21,13;"LIVE
S:";lives
 370 PRINT  PAPER 0; INK 6;AT a,
24;"(9a:9b)"
 380 PRINT AT a+1,24;"  ";AT a-1
,24;"  "
 381 IF INKEY$="0" THEN  GO SUB
600
 382 PRINT AT a+1,24;"  ";AT a-1
```




```
,24;"  "
 390 IF INKEY$="6" THEN  GO SUB
500
 400 IF INKEY$="7" THEN  GO SUB
550
 410 IF psi=1 THEN  RETURN
 420 GO SUB 700
 430 GO SUB 365
 500 LET a=a+1
 510 IF a>20 THEN  LET a=20
 520 RETURN
 550 LET a=a-1
 560 IF a<1 THEN  LET a=1
 570 RETURN
 600 LET ink=INT (RND*4)+4
 605 FOR s=0 TO 40 STEP 10: BEEP
 .001,s: NEXT s
 610 PRINT  PAPER 0; INK ink;AT
a,0;a$
 620 PRINT  PAPER 0; INK 0;AT a,
0;a$
 630 IF a=ex THEN  GO TO 1000
 699 RETURN
 700 IF flaps=1 THEN  GO TO 800
 705 LET flaps=1
 710 LET ex=INT (RND*20)+1
 720 LET e=0
 800 IF e=24 THEN  GO TO 900
 810 PRINT  INK 6; PAPER 0;AT ex
,e;"(9c:9d)"
 812 LET psi=1
 815 GO SUB 365
 820 LET tra=INT (RND*3): LET tr
a=tra-1
 825 PRINT  INK 0; PAPER 0;AT ex
,e;"(2*isp)"
 830 LET ex=ex+tra
 840 IF ex<2 THEN  LET ex=2
 850 IF ex>20 THEN  LET ex=20
 860 LET e=e+1
 865 LET psi=0
 870 RETURN
 900 LET lives=lives-1
 910 PRINT  FLASH 1; INK 4;AT ex
,e;"++"
 920 FOR s=50 TO 0 STEP -.3
 930 BEEP .001,s
 940 NEXT s
 950 FOR f=0 TO 10: BEEP .01,f:
NEXT f
 960 PRINT  INK 0;AT ex,e;"(2*is
p)"
 970 FOR f=1 TO 25: INK ink: PRI
NT AT a,e;"(99:9f)": BEEP .01,-1
2: PRINT AT a,e;" ";AT a,e+1;" "
; INK ink;AT a,e;"(99:9f)": BEEP
 .01,32: PRINT AT a,e;"  ": NEXT
f
 975 LET flaps=0
 980 IF lives<1 THEN  GO TO 1200
 990 GO TO 350
1000 FOR f=1 TO 25: PRINT AT a,e
;"(99:9f)": BEEP .01,2: PRINT AT
 a,e;" ";AT a,e+1;" ";AT a,e;"(9
9:9f)": BEEP .01,-10: PRINT AT a
,e;"  ": NEXT f
1010 LET sc=sc+bonus
1060 LET flaps=0
1070 LET ex=0
1080 GO TO 350
1200 PRINT AT 10,11;"GAME OVER";
AT 12,6;"Press Y for new game"
1210 IF sc>hsc THEN  LET hsc=sc
1220 IF INKEY$="y" THEN  GO TO 3
7
1230 IF INKEY$="n" THEN  STOP
1240 GO TO 1220
9990 SAVE "Laser T." LINE 10
```

AFRICAN MANHUNT



D GIBBS, aged 12, of Sutton Coldfield wrote **African Manhunt** for the 1K ZX-81. Using the cursor keys, lure the wild animals towards the trap you have built in the ground. They are not heavy enough to fall into the hole until they have eaten each other, so you must use all your cunning to trick them.

```
  8 LIST
 10 LET B=PI-PI
 20 LET A=CODE "£"
 30 LET C=INT (RND*CODE "+")
 35 LET G=C+CODE "(92)"
 40 LET D=INT (RND*CODE "3")
 41 LET I=INT (RND*CODE "(9s)")
 45 LET H=INT (RND*CODE "3")
 46 LET J=INT (RND*CODE "9s")
 50 LET S=PI-PI
 60 LET E=INT (RND*CODE "+")
 70 LET F=CODE "3"
 80 LET A=A+(INKEY$="6" AND A<C
ODE "<")*CODE "(92)"-(INKEY$="7"
 AND A>CODE "(91)")*CODE "(92)"
 90 LET B=B+(INKEY$="8" AND B<C
ODE "2")*CODE "(92)"-(INKEY$="5"
 AND B>CODE "(91)")*CODE "(92)"
100 LET I=I+(A>I)-(A<I)
105 SCROLL
110 LET J=J+(B>J)-(B<J)
120 LET E=E+(E<A)-(E>A)
130 LET F=F+(F<B)-(F>B)
131 LET G=G+(G<A)-(G>A)
132 LET H=H+(H<B)-(H>B)
140 CLS
150 PRINT AT A,B;"*";AT E,F;"(9
h)";AT I,J;"(ih)";AT G,H;"(i")";
AT C,D;"O"
160 LET S=S+CODE "(91)"
170 IF A=I AND B=J OR A=E AND B
=F OR A=G AND B=H OR A=C AND B=D
 THEN STOP
180 IF I=E AND J=F AND C=E AND
D=F AND G=C AND H=D THEN GOTO VA
L "230"
190 GOTO VAL "80"
230 PRINT S
```



HOUDINI

FREE HOUDINI from his water tank by breaking the code. You have seven chances to guess the four digits while Houdini's tank fills with water.

Houdini was written for the 16K Spectrum by Janson Allen of Alnwick, Northumberland.

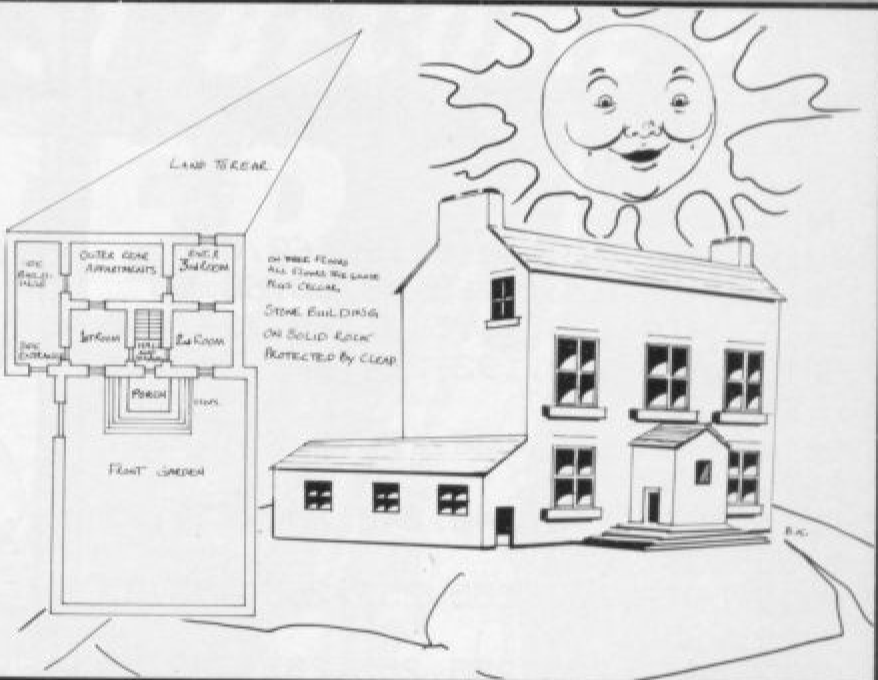
```
  25 PAPER 0
  30 CLS : POKE 23609,50: BORDER
 0: INK 7: PAPER 0: GO SUB 5050
  35 GO SUB 2000
  40 GO SUB 1000
  50 BORDER 0: PAPER 0: INK 7
  80 LET n=10
  90 PRINT AT 0,0;"Guess any num
ber"," from 0 to ";n-1;AT 5,26;"
Right";AT 7,26;"Wrong";AT 9,26;"
CODE"
  95 PRINT ; INK 4;AT 5,24;"(195
)"; INK 2;AT 7,24;"(195)"
  96 PLOT 207,88: DRAW 33,0: DRA
W 0,-9: DRAW -33,0: DRAW 0,9
 100 LET a=INT (RND*n)
 200 LET b=INT (RND*n)
 300 LET c=INT (RND*n)
 400 LET d=INT (RND*n)
 415 FOR y=5 TO 17 STEP 2
 420 INPUT "Guess first number "
;e
 430 INPUT "Guess second number
";f
 440 INPUT "Guess third number "
;g
 450 INPUT "Guess fourth number
";h
 455 PRINT AT y,13;e;f;g;h
 460 IF e<>a THEN  PRINT ; INK 2
;AT 3+y-3,18;"(95)"
 470 IF e=a THEN  PRINT ; INK 4;
AT 3+y-3,18;"(95)"
 480 IF f<>b THEN  PRINT ; INK 2
;AT 3+y-3,19;"(95)"
 490 IF f=b THEN  PRINT ; INK 4;
AT 3+y-3,19;"(95)"
 500 IF g<>c THEN  PRINT ; INK 2
;AT 3+y-3,20;"(95)"
 510 IF g=c THEN  PRINT ; INK 4;
AT 3+y-3,20;"(95)"
 520 IF h<>d THEN  PRINT ; INK 2
;AT 3+y-3,21;"(95)"
 530 IF h=d THEN  PRINT ; INK 4;
AT 3+y-3,21;"(95)"
 535 PLOT 37,81: PLOT 41,81: PRI
```

```
NT ; INK 5;AT 19-y/2,2;"(6*isP)"
 610 FOR z=1 TO 30
 620 IF e=a AND f=b AND g=c AND
h=d THEN  BEEP .05,z: NEXT z: PR
INT AT 11,26; INK 6; FLASH 1;a;b
;c;d: GO TO 640
 630 NEXT y: GO TO 650
 640 PLOT 37,83: PLOT 41,83: PRI
NT AT 19,12; INK 6; FLASH 1;" WE
LL DONE !";AT 20,3;" You Saved
 HOUDINI From";AT 21,13;"Drownin
g"
 645 PRINT ; INK 7;AT 14,27;"a";
 INK 5;AT 15,26;"b";AT 15,27;"c"
;AT 15,28;"d";AT 16,27;"e";AT 17
,26;"f";AT 17,27;"g";AT 17,28;"h
";AT 13,27;"i": GO TO 680
 650 FOR t=30 TO 1 STEP -1
 660 PRINT AT 11,26; INK 6; FLAS
H 1;a;b;c;d;AT 20,9;"SHAME He Dr
owned": BEEP .05,t
 670 NEXT t
 680 PAUSE 400: CLS : PRINT ; IN
K 6;AT 11,0;"Do You Wish To Try
Again ? Y/N": PAUSE 0
 690 IF INKEY$="y" OR INKEY$="Y"
 THEN  CLS : GO TO 40
 700 IF INKEY$="n" OR INKEY$="N"
 THEN  STOP
1000 PLOT 101,29: DRAW 0,110
1005 PLOT 138,29: DRAW 0,110
1010 PLOT 177,29: DRAW 0,110
1015 FOR l=140 TO 16 STEP -16
1020 PLOT 101,l: DRAW 75,0
1021 NEXT l
1030 PLOT 15,31: DRAW 0,64
1040 PLOT 15,31: DRAW 49,0: DRAW
 0,64
1050 CIRCLE 39,84,7: PLOT 41,86:
 PLOT 37,86: PLOT 39,84: PLOT 38
,82: DRAW 3,0: PLOT 39,76: DRAW
0,-24
1060 PLOT 39,52: DRAW -13,-19
1070 PLOT 39,52: DRAW 13,-19
1080 PLOT 39,65: DRAW 10,0: DRAW
 6,10
1090 PLOT 39,65: DRAW -10,0: DRA
W -6,10
1999 RETURN
2500 PLOT 143,50: DRAW 0,20: DRA
W 20,0: PLOT 163,50: DRAW 0,40:
PLOT 143,60: DRAW 20,0
2510 PLOT 71,50: DRAW 15,0: PLOT
 78,50: DRAW 0,70: DRAW 10,0: DR
AW -4,-10: DRAW -5,11
2520 PLOT 100,90: DRAW -8,10: PL
OT 100,120: DRAW 10,0: PLOT 130,
120: DRAW 10,0: PLOT 118,70: DRA
W -8,10
2530 PLOT 105,105: DRAW -9,5: PL
OT 135,90: DRAW -9,5
2545 FOR x=1 TO 30: BEEP .01,x:
PAUSE 4: NEXT x
2550 FOR n=7 TO 0 STEP -1
2560 BORDER n: PAUSE 20: NEXT n:
 NEXT x: CLS
3000 PRINT '"The object is to gu
ees a 4      number code,in the
correct order ,to save   HOUDINI
 ."
3010 PRINT '"ENTER one number at
 a time,     between 0 and 9 e.g
:-"
3020 PRINT '"            0 - ENTER"
3030 PRINT '"            6 - ENTER"
3040 PRINT '"            9 - ENTER"
3050 PRINT '"            2 - ENTER"
3060 PRINT '''"    PRESS ANY KEY
TO CONTINUE": PAUSE 0: CLS

3070 PRINT '"    When you have E
NTERed your  number,you will see
 which is    correct and which i
sn't,e.g:-"
3080 PRINT AT 5,10;"0692"; INK 4
;AT 5,16;"(i95)"; INK 2;AT 5,17;
"(i95)"; INK 4;AT 5,18;"(i95)";
INK 4;AT 5,18;"(i95)"; INK 2;AT
5,19;"(i95)"
3090 PRINT AT 7,18;"Right";AT 9,
18;"Wrong"; INK 4;AT 7,16;"(i95)
"; INK 2;AT 9,16;"(i95)"
4000 PRINT ''"    You have 7 cha
nces to crack the code before
HOUDINI      drowns."


4010 PRINT AT 20,2;"PRESS ANY KE
Y TO CONTINUE"; INK 5; FLASH 1;A
T 18,10;"GOOD LUCK !!": PAUSE 0:
 CLS
5020 RETURN
5050 FOR a=USR "a" TO USR "i"+7
5060 READ user: POKE a,user
5070 NEXT a: RETURN
5080 DATA 60,126,189,231,231,126
,102,60
5090 DATA 0,128,193,162,164,43,2
6,8
6000 DATA 24,255,255,255,239,255
,239,255
6010 DATA 0,129,67,37,26,196,40,
16
6020 DATA 239,255,239,255,0,255,
255,255
6030 DATA 0,0,0,0,0,6,15,14
6040 DATA 238,238,238,238,238,23
8,239,108
6050 DATA 0,0,0,0,0,192,224,224
6060 DATA 0,0,60,66,60,0,0,0
```

THE HOUSE THAT JACK BUILT



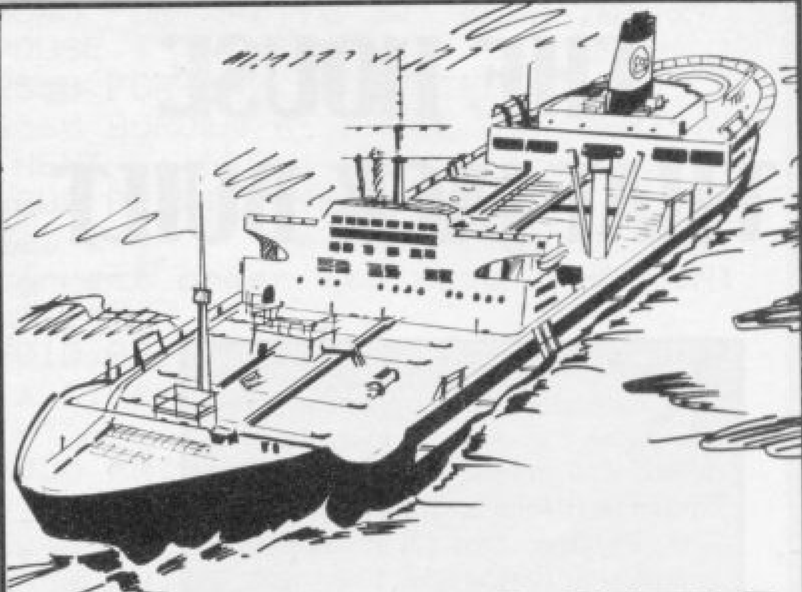
RACE to complete your house ahead of your opponent. Press the "s" key to start the dice rolling and release to stop it. **The House that Jack Built** was written by Craig Mitchell, aged 12, of Middleton, Manchester, for the 16K Spectrum.

```
  10 DIM s$(192): GO SUB 9000: GO SUB 9100
  20 CLS : BORDER 4: PAPER 5: INK 9: CLS : GO SUB 9300
  25 PLOT 132,40: DRAW 0,135: PLOT 133,40: DRAW 0,135
  30 DIM h(2): LET h(1)=1: LET h(2)=1
  35 PRINT AT 0,4; PAPER 1; INK 7; BRIGHT 1;"Player 1";AT 0,21; PAPER 2;"Player 2"
  40 LET pl=INT (RND*2)+1
  50 PRINT AT 16,8; PAPER pl; INK 7;"PLAYER ";pl;"'S TURN"
  55 PRINT AT 17,9; PAPER pl; INK 7;"YOU REQUIRE A";AT 18,15;h(pl)
  60 GO SUB 9200
  70 IF h(pl)=dice THEN LET pos=17*(pl=2): GO SUB h(pl)*1000: LET h(pl)=h(pl)+1
  71 IF h(pl)=7 THEN GO TO 7000
  75 IF h(pl)<>dice THEN GO TO 100
  80 LET h(pl)=h(pl)+1
 100 BEEP .1,10: BEEP .2,-2: GO SUB 9300: LET pl=pl+(pl=1)-(pl=2): GO TO 50
1000 FOR f=15 TO 8 STEP -1: PRINT AT f,pos+3; INK 2; PAPER 7;"(10*9a)": BEEP .01,f: NEXT f
1010 RETURN
2000 PAPER 5: FOR f=0 TO 5
2010 PRINT AT f+2,pos+7-f; INK 3;"(9c)";: FOR i=pos+7-f+1 TO pos+7+f: PRINT AT f+2,i; INK 3;"(isp)";: NEXT i: PRINT INK 3;"(9d)"
2020 BEEP .01,f*3: NEXT f
2030 RETURN
3000 PRINT AT 5,11+pos; INK 3; PAPER 2;"(9d)";AT 4,11+pos;" ";AT 3,11+pos; PAPER 5; INK 0;"(9b)"
3005 BEEP .1,0
3010 RETURN
4000 PRINT AT 9,4+pos; INK pl; PAPER 5;"(9j:9k)";AT 10,4+pos;"(9l:9m)"
4010 BEEP .1,10
4020 RETURN
5000 PRINT AT 9,10+pos; INK pl; PAPER 5;"(9j:9k)";AT 10,10+pos;"(9l:9m)"
5010 BEEP .1,20
5020 RETURN
6000 PRINT AT 12,7+pos; INK pl; PAPER 6;"(94:197)";AT 13,7+pos;"(9f:92)";AT 14,7+pos;"(99:isp)";AT 15,7+pos;"(9h:91)"
6010 FOR f=1 TO 30: BEEP .01,-f: BEEP .01,f: NEXT f
6020 RETURN
7000 GO SUB 9300: PAPER 4
7005 FOR f=1 TO 5: FOR i=0 TO 7: IF i=4 THEN LET i=5
7006 IF f=5 AND i=7 THEN FLASH 1: PAPER pl
7010 PRINT AT 16,0; INK i;"THE END"
7020 BEEP .04,f+i: NEXT i: NEXT f
7030 FLASH 0
7040 PRINT AT 21,9; BRIGHT 1; PAPER 6; INK 0;"Player ";pl;" wins."
7050 PRINT  0; INK 1; PAPER 7; FLASH 1;"        Another game ? y/n      "
7060 IF INKEY$="y" OR INKEY$="y" THEN GO TO 20
7070 IF INKEY$<>"n" AND INKEY$<>"N" THEN BEEP .02,4: GO TO 7060
```

Continued over

Continued from page 83.

```
7080 STOP
9000 RESTORE 9010: FOR f=USR "a"
 TO USR "m"+7: READ a: POKE f,a:
 NEXT f
9005 RETURN
9010 DATA 0,0,60,60,60,60,0,0
9011 DATA 0,0,0,60,60,60,60,60
9012 DATA 1,3,7,15,31,63,127,255
9013 DATA 128,192,224,240,248,25
2,254,255
9014 DATA 126,126,126,0,231,231,
231,0
9015 DATA 240,240,240,240,255,25
5,255,207
9016 DATA 207,255,255,255,255,25
5,255,255
9017 DATA 255,255,255,255,248,24
8,255,255
9018 DATA 255,255,255,255,31,31,
255,255
9019 DATA 255,224,224,240,240,24
0,248,248
9020 DATA 255,7,7,15,15,15,31,31
9021 DATA 248,248,240,240,240,22
4,224,255
9022 DATA 31,31,15,15,15,7,7,255
9100 DIM a$(6,3): DIM b$(6,3): D
IM c$(6,3)
9110 LET b$(1)=" (9a)"
9120 LET a$(2)="(9a)"
9130 LET c$(2)="  (9b)"
9140 LET a$(3)=a$(2): LET b$(3)=
b$(1): LET c$(3)=c$(2): LET a$(4
)="a a": LET c$(4)=a$(4)
9150 LET a$(5)=a$(4): LET b$(5)=
b$(1): LET c$(5)=a$(4): LET a$(6
)=a$(4): LET b$(6)=a$(4): LET c$
(6)=a$(4)
9160 LET d$="(94:3*i93:i97)": LE
T e$="(91:3*93:92)"
9170 RETURN
9200 INK pl: PAPER 6
9210 PRINT AT 17,0;d$;AT 21,0;e$
: FOR f=18 TO 20: PRINT AT f,0;"
(95:   i95)": NEXT f
9220 LET dice=INT (RND*6)+1
9230 PRINT AT 20,6; PAPER 7;"Hol
d ""s"" to start  ";AT 21,6;"and
 release to stop"
9235 IF INKEY$<>"s" THEN  GO TO
9235
9240 IF dice=7 THEN  LET dice=1
9250 PRINT AT 18,1;a$(dice);AT 1
9,1;b$(dice);AT 20,1;c$(dice)
9260 BEEP .008,dice+10
9270 IF INKEY$="" THEN  RETURN
9280 LET dice=dice+1: GO TO 9240
9300 PRINT AT 16,0; PAPER 4;s$
9310 RETURN
```



SOUTH PACIFIC

```
  5 LET X=12
 10 LET A=INT (RND*X)
 15 LET B=INT (RND*X)
 20 LET C=A*B
 30 PRINT "(32*97)"
 35 PRINT "ENEMY CRAFT IS ";B;"
MILES AWAY"
 40 PRINT "TYPE FORCE NEEDED TO
FIRE YOUR  RX5 MISSILE"
 45 PRINT "(32*96)"
 46 PRINT
 50 FOR D=1 TO 10
 55 INPUT E
 60 IF E=C THEN GOTO 100
 65 IF E<C THEN PRINT E;" IS TO
O LOW"
 70 IF E>C THEN PRINT E;" IS TO
O HIGH"
 75 NEXT D
 85 PRINT AT 19,8;"  YOU ARE HI
T"
 90 STOP
100 CLS
105 PRINT AT 10,1;"ENEMY CRAFT
HAS BEEN DESTROYED"
110 PAUSE 150
115 CLS
120 GOTO 5
```

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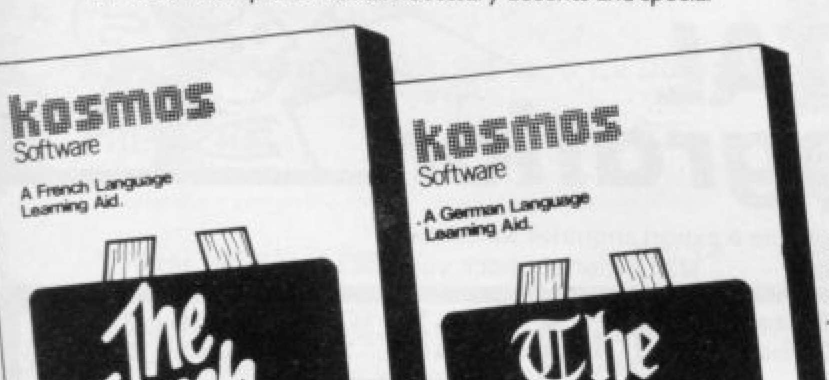
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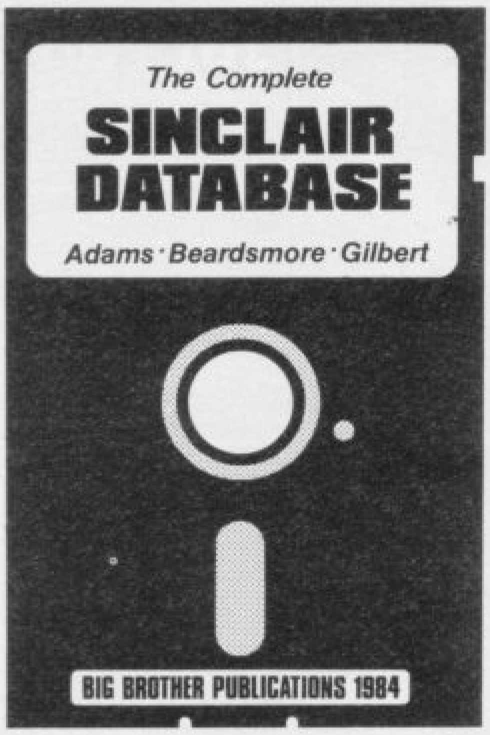
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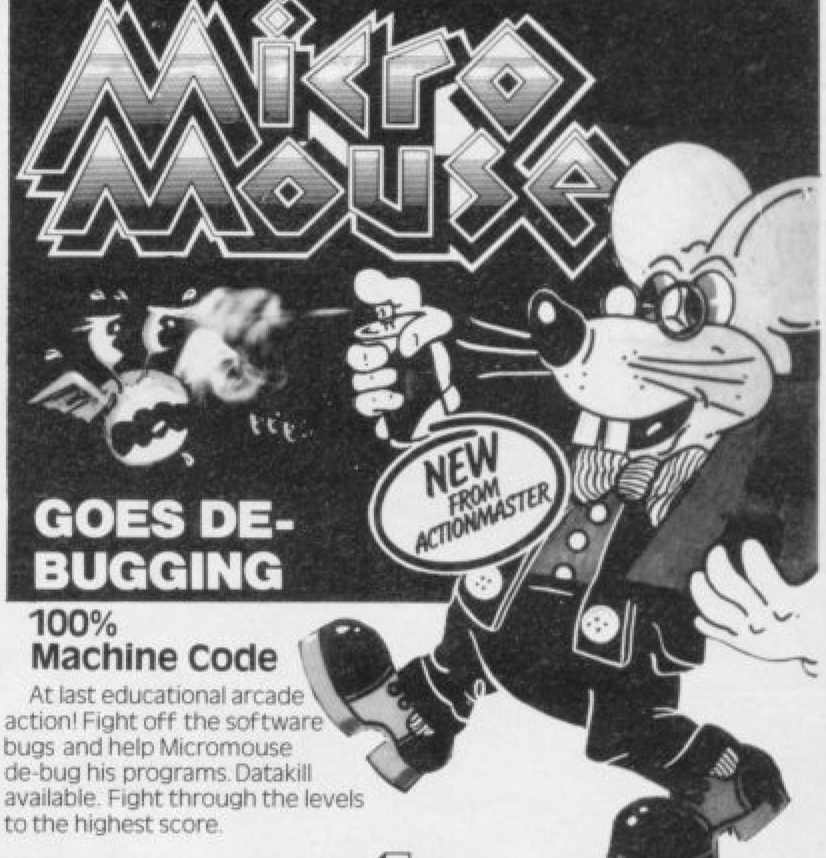
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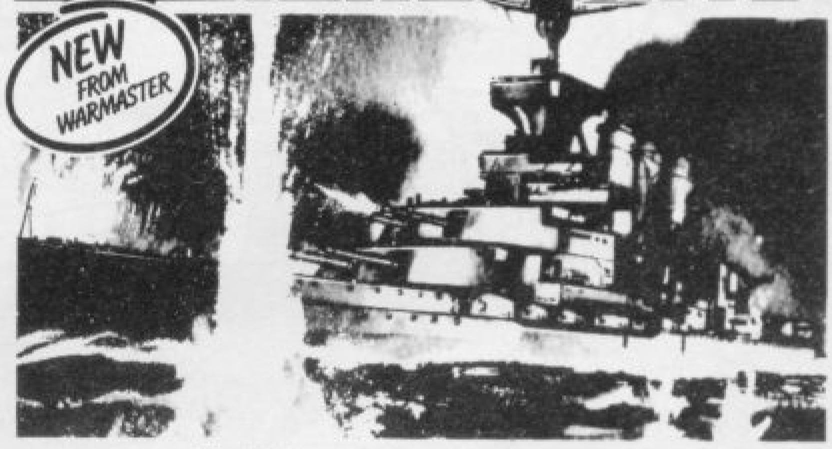


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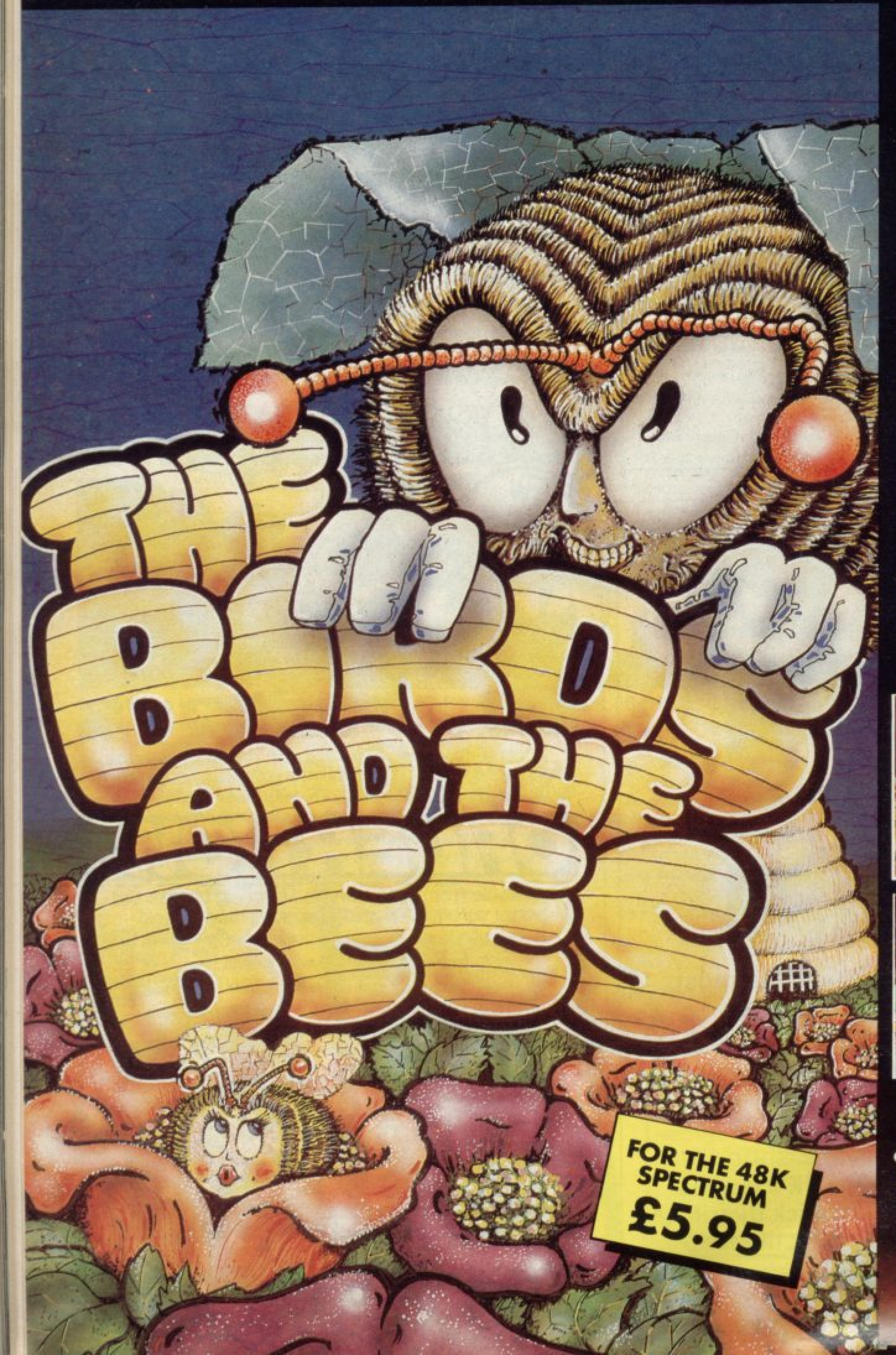
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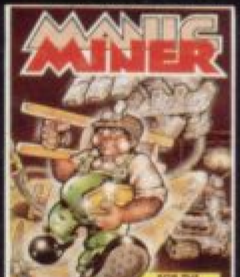


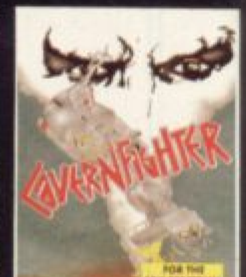


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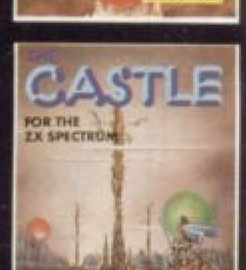
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Moving up the memory towards faster graphics

In the second article of his series, John Kerrigan explains some more machine code routines

LAST MONTH'S article showed a code routine, S0, which calculates the address in screen memory immediately below a given address — or the present position. Now I want to show a similar routine, S2, to go in the opposite direction — upwards. I want to explain how S0 and S2 work. Next month we can use them to show a figure — larger than a character — anywhere on the screen. In machine code that figure will be printed much faster than is possible in Basic.

S0 and S2 are very similar. Let us concentrate on S2 — in figure one — with this. On Entry under the specifications states: "HL must point to an address in the Spectrum screen memory." Both H and L are registers on the Z-80 chip. Such registers are not part of internal memory addresses. They are held on chips separate from the Z-80. They can be thought of as boxes just large enough to hold numbers within the range 0 to 255 with labels on the outside of each box running from 0000H to FFFFH — or, in the case of 16K Spectrums, running from 0000H to 7FFFH. In normal counting the labels run from 0 to 65535 — or 0 to 32767. Spectrum screen memory runs from 4000H to 57FFH.

The main registers on the Z-80 chip are A, B, C, D, E, H and L. There are other registers but we can let them look after themselves for the moment. Each of the registers can hold a byte. We can use B and C, D and E and H and L as register pairs when we want to hold a two-byte or 16-bit number. Each address is a two-byte number. So the entry condition of S2 means that H must hold the high byte and L must hold the low byte of a number between 4000H and 57FFH. The condition would be met if H held 53H and L held 9CH.

Moving down to the routine, the first line sets the position in memory where the routine will be assembled. In the case of S2, the origin (ORG) is 7100H — counting in hexidecimal to base 16 — or 28928 in normal counting. The second line starts with the address in memory to be loaded with the code — 7100H. The next column shows the code 7CH, which is $7 \times 16 + 12 = 124$ in normal counting. The third column is the line number (110), the fourth column has the label which is the title of the routine (S2) and the fifth column shows the assembly language instruction (LD A,H).

Page 185 in the Spectrum manual is part of Appendix A which lists the Spectrum character set and the machine code instructions. Next to number 124 on that page you will see that that value as a character is a vertical line. Under the column headed Z-80 Assembler is the instruction in our routine: "ld a,h". There is another column on that page headed "-after CB". In that column on the same row is the assembler instruction "bit 7,h". We will deal with that instruction later.

For the moment it is worth noting that any number in an address in memory could be interpreted in a variety of ways. If it is in the middle of text, it could be a character. It could be a variable — a number in its own right. It could be a part of one instruction or it could be the whole of another instruction. The way in which the Z-80 decides to interpret any number in internal memory depends on which other numbers it has interpreted immediately prior to that one.

"LD H,L" copies the 8-bit number (byte) held in the H register into the A register. If the A register holds 22H and the H register holds 53H, then, after "LD A,H", both the H and the A register will hold 53H. The number 22H held previously in the A register is then lost. So one must hope that it was either unimportant or was saved elsewhere.

The third line contains the two-byte instruction E607 - AND 7. E6H is the AND part and 07H is the number to be ANDed. All AND instructions use the

Figure 1.

SPECIFICATION S2 — Spectrum.
GENERAL DESCRIPTION: Takes an address in screen memory and returns the address of the scan immediately above unless the original address was on the top scan of the screen.
ON ENTRY: HL must point to an address in the Spectrum screen memory.
ON EXIT: If the entry HL was not on the top scan of the screen then the zero flag is re-set and the exit HL will be one scan above the entry HL. If the entry HL was on the top scan of the screen then the zero flag is set and the exit HL will be the same as the entry HL.
USES: A, D, E, H, L.

```
7100              00100        ORG 7100H
7100  7C          00110 S2     LD A,H          ;LOAD MSB
7101  E607        00120        AND 7           ;TOP 5 BITS NOW ZERO
7103  CA0871      00130        JP Z,TOLI       ;MUST BE ON TOP SCAN OF CHR
7106  25          00140        DEC H           ;MOVE UP 1 SCAN
7107  C9          00150        RET
7108  7D          00160 TOLI   LD A,L          ;LOAD LSB
7109  E6E0        00170        AND 0E0H        ;LOWEST 5 BITS NOW ZERO
710B  CA1371      00180        JP Z,TOSE       ;MUST BE ON TOP SCAN OF SECTOR
710E  11E006      00190        LD DE,06E0H
7111  19          00200        ADD HL,DE
7112  C9          00210        RET
7113  7C          00220 TOSE   LD A,H
7114  FE40        00230        CP 40H
7116  C8          00240        RET Z           ;ON TOP SCAN OF SCREEN
7117  112000      00250        LD DE,0020H
711A  Å7          00260        AND A           ;RESET C FLAG
711B  ED52        00270        SBC HL,DE
711D  C9          00280        RET
0000              00290        END
00000 TOTAL ERRORS
S2     7100 00110
TOLI   7108 00160 00130
TOSE   7113 00220 00180
```

Figure 2.

Hex decimal to binary conversion

Hex digit	Binary equivalent
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001
A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

A register. They are sometimes referred to as masking instructions because they have the effect of leaving a part of the previous contents of the A register while cutting-off other parts.

To see the effect of an AND instruction, both the numbers must be expressed in their binary form. Fortunately there is an easy relationship between binary — counting to the base 2 — and hexadecimal — counting to the base 16. Each hex digit converts into four binary digits. The conversion for the 16 hex digits is shown in figure two, which shows the equivalent of 5 is 0101 and the equivalent of 3 is 0011. If the A register contains 53H, the binary equivalent will be the two joined — that is 01010011. Using the same process, the binary equivalent of 07H is 00000111.

The AND instruction will compare each binary digit or bit of the number in the A register to its equivalent digit in the mask. Only if both digits are 1s will a 1 be left in that bit of the A register. In all other circumstances a 0 is placed, or left, in that bit of the A register.

In our example the only bits in 01010011 and 00000111 where both digits are 1s are the lowest two. So, if the A register holds 53H before "AND 7", after the instruction the A register will hold 00000011 in binary (or 03H). The instruction has the effect of masking the topmost five bits and setting or re-setting the zero flag within the Z-80 chip. The zero flag will be set if the result of the operation is zero. It will be re-set otherwise. In that case it will be re-set because the result is not zero.

The zero flag is relevant to the effect of the next line :"JP Z,TOLI". That is the assembly language equivalent of "Jump, if the zero flag is set, to the line in the program denoted TOLI". TOLI is a symbol devised especially for this routine; it is not part of standard assembly language. It is intended to imply that this branch is made if the original HL points to the TOp or a character LIne.

The second column shows that it has been assembled as CA 08 71H. The first byte (CAH) is the instruction jump if the zero flag is set. The following two bytes (08 71H) tell the Z-80 where to jump to. In standard Z-80 fashion they are back to front; the address with TOLI in the symbol column is 71 08H.

Last month the organisation of the Spectrum screen was described. In each sector the top scans of each of the eight character lines are stored first. In sector 0 the top scans run from 4000H to 40FFH; in sector 1 the top scans run from 4800H to 48FFH; and in sector 2 the top scans run from 5000H to 50FFH. So the most significant bytes of each of the top scans of those sectors will be 40H, 48H or 50H — in binary 01000000, 01001000 or 01010000. In each case ANDing with 7 (00000111) gives the answer 00000000 and sets the zero flag.

In our example the MSB was 53H which means that it lies on the fourth scan of a character — or scan three if counting begins at scan 0. The zero flag was not set and so the jump to TOLI would not be made and control would pass to the instruction on the next line :DEC H. DEC is short for DECrement — that is take one off the number stored in the H register. The next line is RET; that is RETurn to whichever routine called by S2. In this case HL would contain 529CH on return.

Let us take another example entry HL. Let it be 4865H, which is on the top scan of a character position. The zero flag would have been set by AND 7 and so control would have been passed to the byte at 7108H (TOLI). That byte is 7DH - LD A,L; so the A register will be loaded with the contents of L, in this case 65H, whereupon there is another AND instruction. In this case : AND E0H. The extra 0 in figure one is required by some assemblers to indicate that the E is the hexadecimal number and not the start of a symbol.

E0H is 11100000 in binary. So this time it is the lowest five bits which will be masked. Once again a jump will depend on whether the zero flag is set. This time the jump is to TOSE which is intended to imply the TOp of a SEctor. Each character line consists of 20H (32) characters, each of which is one byte wide. So the top scans of the first line of characters in sector 0 will run from 4000H to 401FH; in sector 1 they will run from 4800H to 481FH; and in sector 2 they will run from 5000H to 501FH.

In each case the range for the least significant byte is from 00H to 1FH — that is 00000000 to 00011111 in binary. Thus, if the entry HL points to the top scan of a sector, ANDing with 0EH will result in zero and set the zero flag.

In our example, where the entry HL is 4865H, the LSB will be 01100101 in

continued on page 92

Figure 3.

SPECIFICATIONS DOSC — Spectrum.
GENERAL DESCRIPTION: A routine which tests S0. The routine reads the present screen position held in byte variable V1 loads that position will zero (paper), calls S0 (down a scan), re-sets V1 with the new present position and then loads the new present position with 255 (FFH or ink).
ON ENTRY: S0 must be in memory starting at 7000H. Addresses 7050H and 7051H (Variable V1) must be loaded with a valid address in Spectrum screen memory.
ON EXIT: If the entry value stored in V1 was on the bottom scan of the screen, then (a) the exit V1 will equal the entry V1 and (b) that address will be loaded with FFH. If the entry value stored in V1 was on any scan of the screen other than the bottom scan, then (a) the exit V1 will be the scan below the entry V1, (b) the entry V1 will be loaded with 0 and (c) the exit V1 will be loaded with FFH.
USES: V1, A, D, E, H, L (Note that, although this routine may appear to use only H and L, it also uses A, D and E because it calls S0.)

```
7040          00100       ORG 7040H
7040  2A5070  00110 DOSC  LD HL,(V1)       ;LOAD PRESENT POSITION INTO HL
7043  3600    00120       LD (HL),0        ;SET PRESENT POS TO PAPER
7045  CD0070  00130       CALL S0          ;DOWN A SCAN
7048  225070  00140       LD (V1),HL       ;RECORD NEW POSITION IN V1
704B  36FF    00150       LD (HL),0FFH     ;SET NEW POSITION TO INK
704D  C9      00160       RET
7000          00170 S0    EQU      7000H
7050          00180 V1    ENQ      7050H
0000          00190       END
00000 TOTAL ERRORS
DOSC  7040 00110
S0    7000 00170 00130
V1    7050 00180 00110 00140
```

continued from page 91

binary. ANDing with E0H produces 01100000 and thus the zero flag will be re-set and the jump will not be made to TOSE. Instead, control will pass to the next instruction : LD DE,06E0H. That instruction LoaDs the D register with 06H and the E register with E0H. The following instruction (ADD HL,DE) adds the contents of the two register pairs HL and DE and returns the result in the HL register pair.

In that case, before the ADD HL,DE instruction, HL will contain 4865H and DE will contain 06E0H. After the instruction, HL will contain 4F45H, DE will still contain 06E0H and the zero flag will be re-set, because the result of the arithmetic was not zero. 4865H is on the top scan of character row 2 of sector 1. Counting in the normal way from the top of the screen, that is the 11th row of characters. 4F45H is on the bottom scan of character row 1 of sector 1.

Let us take a third example of an entry HL. Let it be 5019H which is on the top scan of a sector. In this case the jump would have been made to TOLI and so would the jump have been made to TOSE. At TOSE the A register is once again loaded with the contents of the H register — in this case 50H.

The next instruction is :CP 40H. That is the assembly language equivalent of "ComPare the contents of the A register with 40H". Such an instruction will not change the numbers held in the main registers but it will affect the flags. If the number in A is 40H, the zero flag will be set. If it is not 40H the zero flag will be re-set.

We already know that if the MSB is 40H and we are on the top scan of a sector we are at the top of the screen. There is no way of going higher and so the next instruction RETurns if the zero flag is set. LD DE,0020H in line 250 is similar to LD DE,06E0H in line 190 but AND A in line 260 is strange.

AND A has no effect at all on the A register. It is ANDing the number in the A register with itself. The only effect it has is on the flags. In particular it re-sets the carry flag. The reason that this odd instruction appears is that the next instruction (SBC HL,DE) is a "subtract with carry".

If the carry flag is re-set, it will equal 0. That will mean that the "subtract with carry" becomes a simple subtract. It is usual to find the two instructions AND A and SBC HL,DE going together because the Z-80 instruction set does not contain a simple 16-bit subtract and so that combination of instructions is used to achieve the same effect. As with the ADD instruction which used HL, this pair of instructions will take the number in DE away from the number at present in HL and return the answer in HL.

In our example, where the entry HL is 5019H, subtracting 0020H will leave HL holding 4FF9H. The entry position was on the top scan of sector 2 and the exit position will be on the lowest scan of sector 1.

We must test S0 and S2 to prove that they work. Figure three contains a simple routine (DOSC) which will set to paper the present screen position, then call S0 to find the scan immediately beneath the present position, set that to ink and then return to Basic. Figure four contains a similar routine (UPSC) which will move in the opposite direction, upwards with S2. Figure five, contains a Basic program to enable us to move an ink line up and down the scans by pressing the "U" and "D" keys.

● *John Kerrigan runs courses in Z-80 Assembly Language. Details from Alligator Data Ltd 01-674 8512.*

Figure 4.

SPECIFICATIONS UPSC — Spectrum.
GENERAL DESCRIPTION: A routine which tests S2. The routine reads the present screen position (held in 2-byte variable V1), loads that position will zero (paper), calls S2 (up a scan), re-sets V1 with the new present position and then loads the new present position with 255 (FFH or ink).
ON ENTRY: S2 must be in memory starting at 7100H. Addresses 7050H and 7051H (Variable V1) must be loaded with a valid address in Spectrum screen memory.
ON EXIT: If the entry value stored in V1 was on the top scan of the screen, then the exit V1 will equal the entry V1 and that address will be loaded with FFH. If the entry value stored in V1 was on any scan of the screen other than the top scan, then the exit V1 will be the scan above the entry V1, the entry V1 will be loaded with 0 and (c) the exit V1 will be loaded with FFH.
USES: V1, A, D, E, H, L Note that although this routine may appear to use only H and L, it also uses A, D and E because it calls S2.

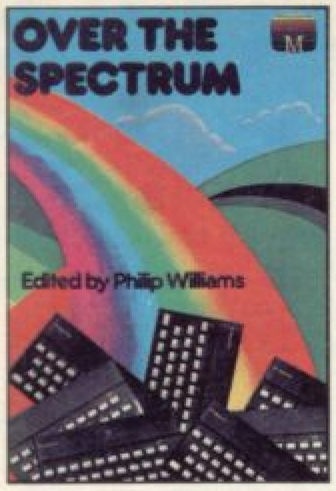
```
7030            00100        ORG 7030H
7030  2A5070    00110 UPSC   LD HL,(V1)     ;LOAD PRESENT POSITION INTO HL
7033  3600      00120        LD (HL),0      ;SET PRESENT POS TO PAPER
7035  CD0071    00130        CALL S2        ;UP A SCAN
7038  225070    00140        LD (V1),HL     ;RECORD NEW POSITION IN V1
703B  36FF      00150        LD (HL),0FFH   ;SET NEW POSITION TO INK
703D  C9        00160        RET
7100            00170 S2     ENQ     7100H
7050            00180 V1     ENQ     7050H
0000            00190        END
00000 TOTAL ERRORS
S2      7100 00170 00130
UPSC    7030 00110
V1      7050 00180 00110 00140
```

Figure 5.

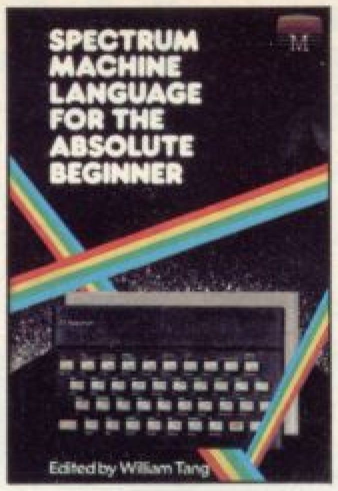
Basic Program to test S0 and S1.

```
 10 REM SET STACK BELOW MACHINE CODE
 20 CLEAR 28671
 30 REM S0 MACHINE CODE
 40 DATA 124,230,7,254,7,202,10,112,36,201,125,230,224,254,
    224,202,25,112,17,224,6,167,237,82,201,124,254,87,200,17,32,0,25,201
 50 REM POKE S0 INTO MEMORY
 60 FOR A=28672 TO 28705 : READ B : POKE A,B : NEXT A
 70 REM UPSC MACHINE CODE
 80 DATA 42,80,112,54,0,205,0,113,34,80,112,54,255,201
 90 REM POKE UPSC INTO MEMORY
100 FOR A=28720 TO 28733 : READ B : POKE A,B : NEXT A
110 REM DOSC MACHINE CODE
120 DATA 42,80,112,54,0,205,0,112,34,80,112,54,225,201
130 REM POKE DOSC INTO MEMORY
140 FOR A=28736 TO 28749 : READ B : POKE A,B : NEXT A
150 REM INITIAL VALUE OF V1
160 DATA 16,72
170 REM POKE INITIAL VALUE OF V1 INTO MEMORY
180 FOR A=28752 TO 28753 : READ B : POKE A,B : NEXT A
190 REM S2 MACHINE CODE
200 DATA 124,230,7,202,8,113,37,201,125,230,224,202,19,
    113,17,224,6,25,201,124,254,64,200,17,32,0,167,237,82,201
210 REM POKE S2 INTO MEMORY
220 FOR A=28928 TO 28957 : READ B : POKE A,B : NEXT A
230 PAUSE 0
240 IF INKEY="U" THEN RANDOMISE USR 28720
250 IF INKEY="D" THEN RANDOMISE USR 28736
260 GOTO 230
```

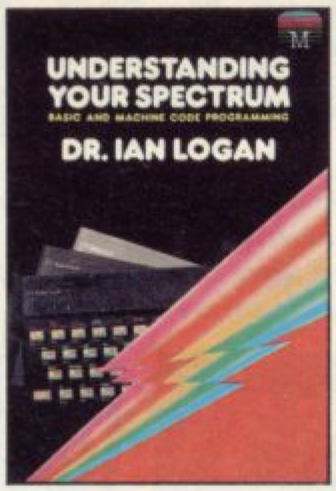

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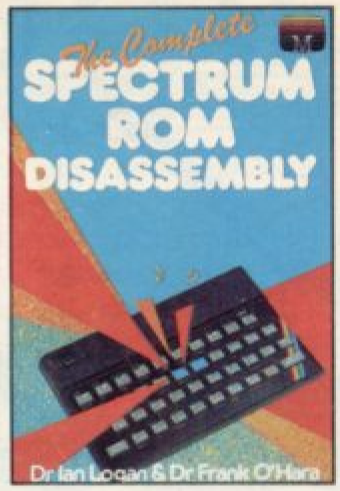
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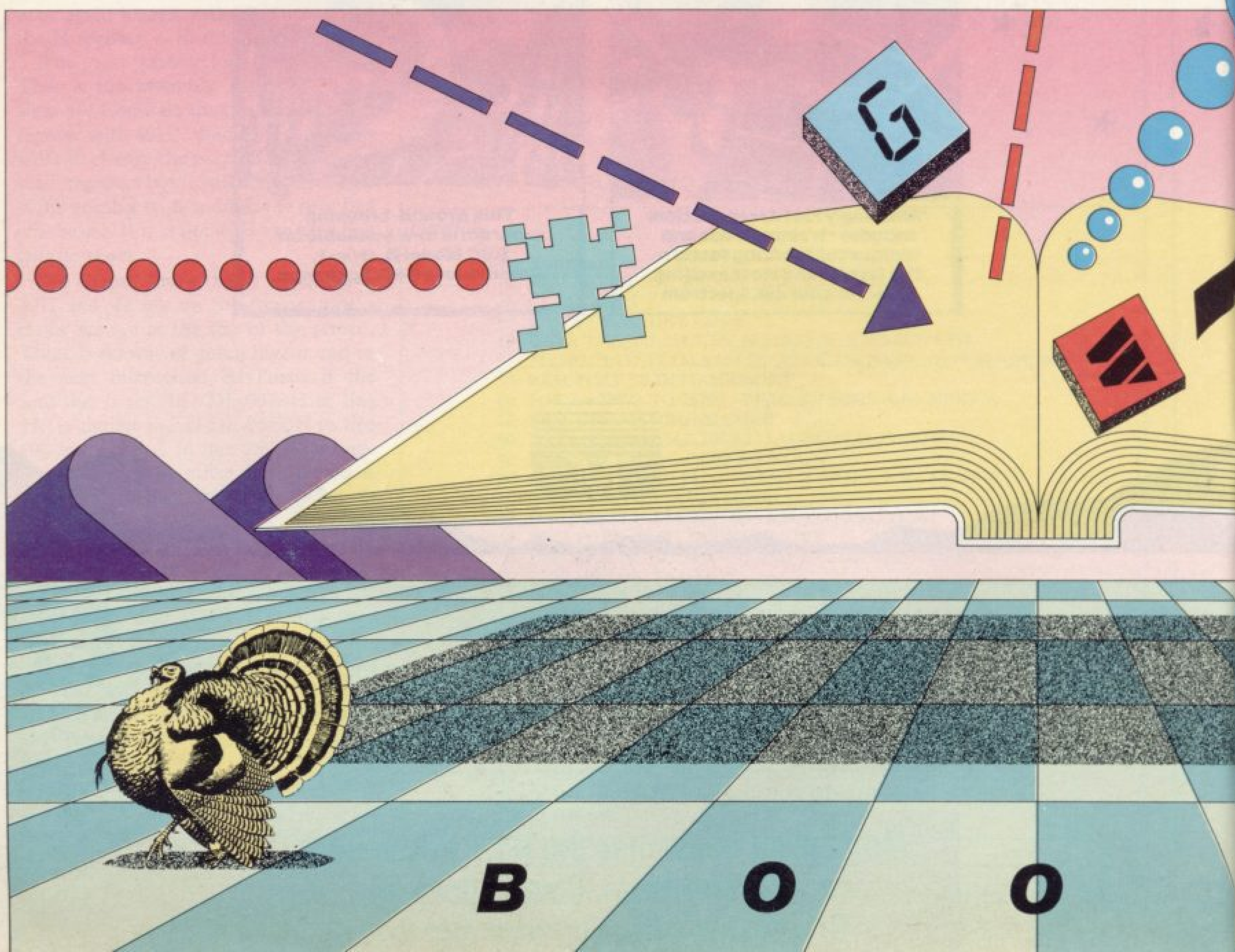


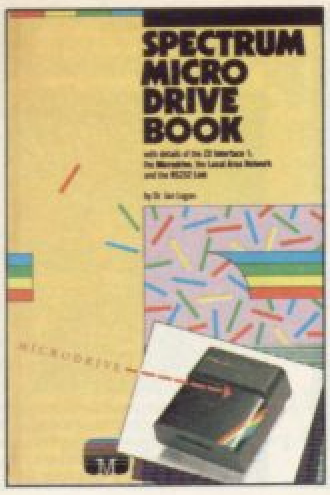
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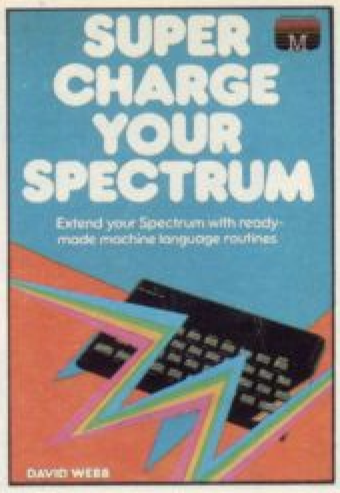
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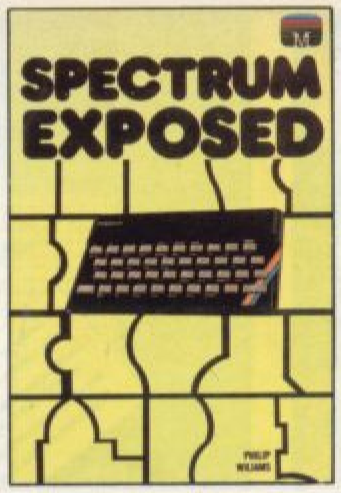




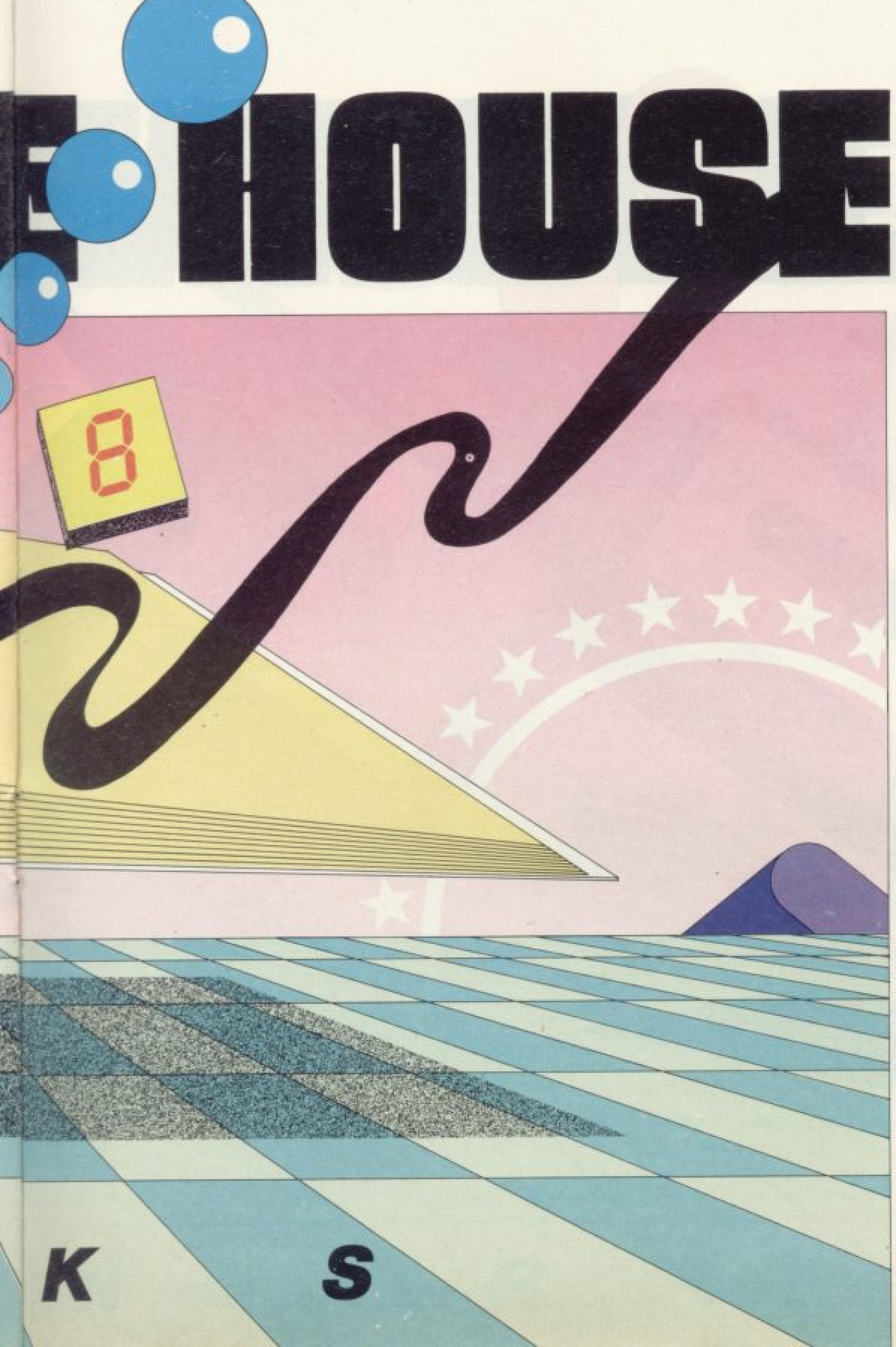
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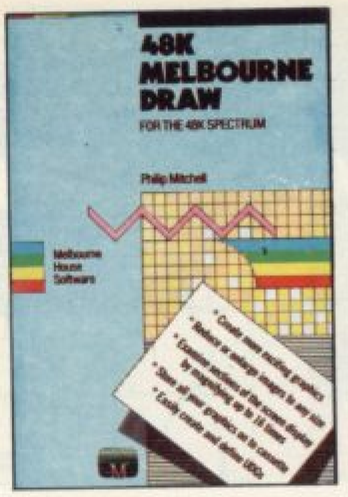
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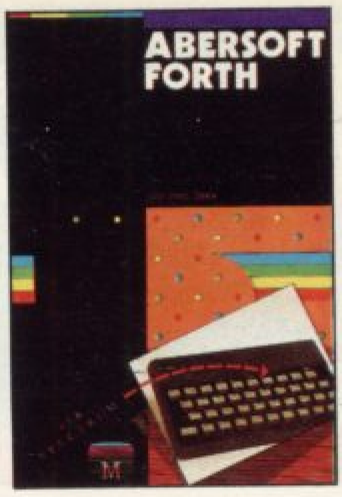
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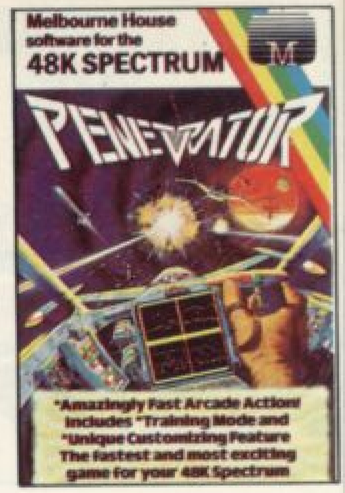
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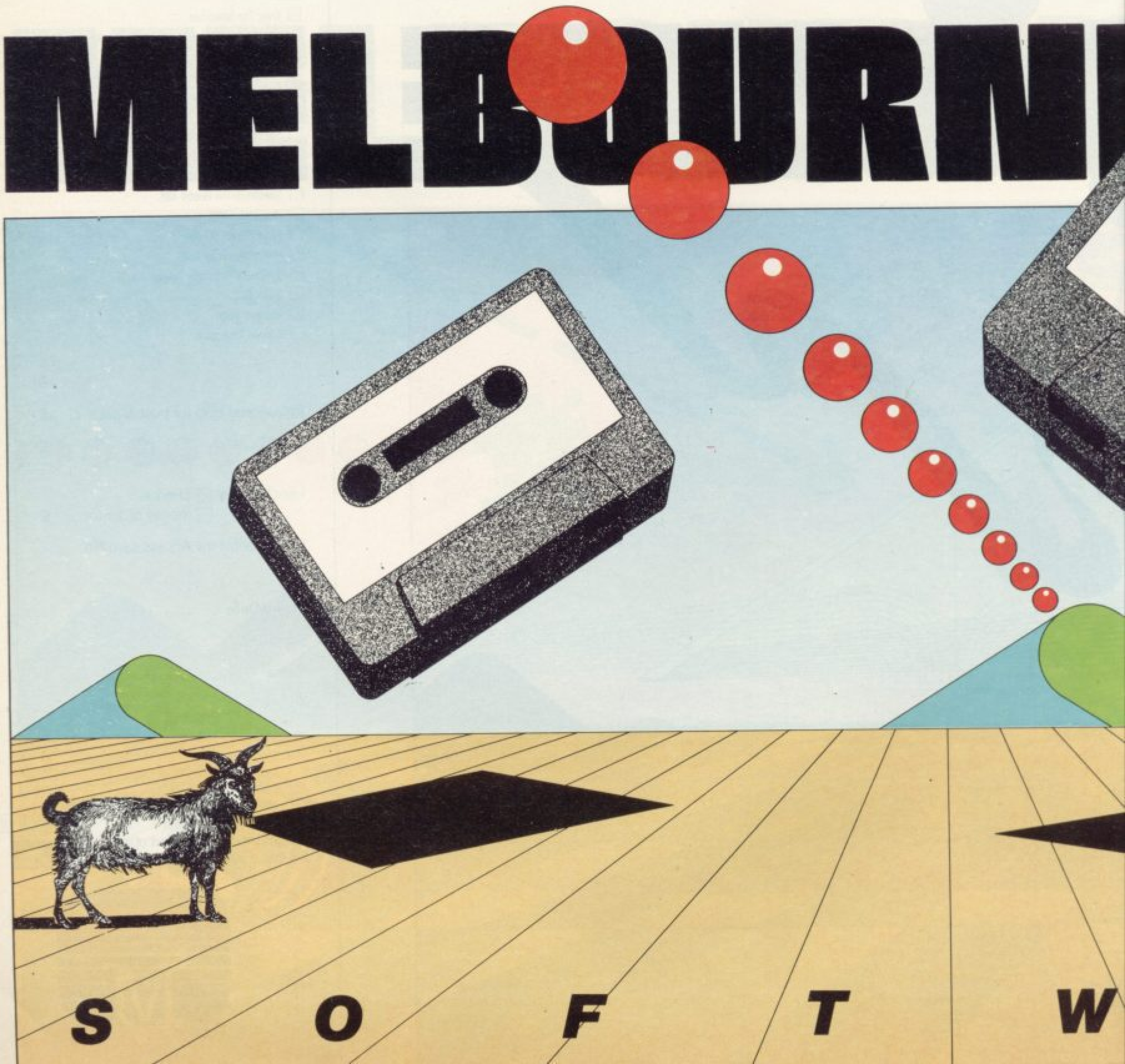
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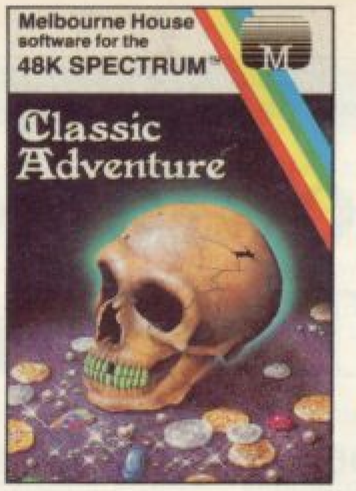
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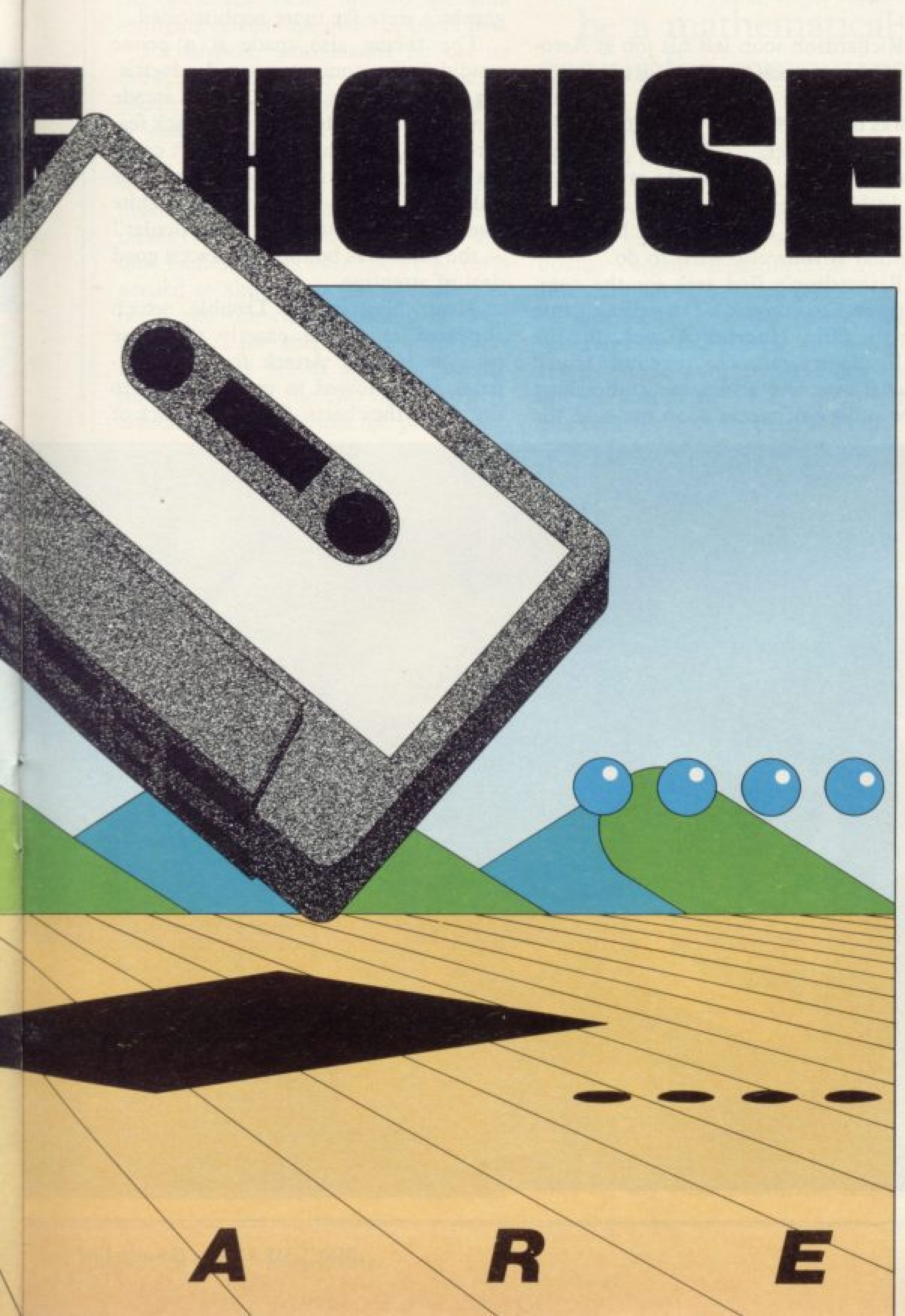


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Swinging into action with Jungle Trouble

In the second of our new series on best-selling programmers, Nicole Segre talks to Mike Richardson about his latest efforts

THERE WAS very little publicity about the appearance of a Spectrum game called **Jungle Trouble** towards the end of last summer but in a few months it had become a sudden best-seller, over-shadowing many more spectacular arcade games by a quiet combination of wit and originality.

Jungle Trouble features an intrepid explorer attempting to make his way through a tropical forest. Among the difficulties he must overcome are a series of stepping stones across a crocodile-infested river, a thicket of trees which he must chop down despite the persistent efforts of a horde of monkeys to run off with his axe, and finally a pit of flames which he has to swing across on a rope in a manner of which Tarzan would be proud.

The author of this eventful game is 26-year-old Mike Richardson, an unassuming former chemist from Wellington, Somerset, for whom Jungle Trouble has meant an unexpected change of direction.

Richardson began writing the program for his amusement when he was working as an analyst in the laboratories of Aerosol International at Taunton. "My wife Jane suggested the stepping stones," he says, "and I just took it from there." Richardson started the program in Basic but when he saw an advertisement in the local paper asking for machine code programmers he quickly converted what he had done into machine code and applied for the job. The outcome was his present association with Durell Software and its founder-director, Robert White. White, who had been working as a computer-aided design specialist for Oxford Area Health Authority, had left his job and set up the company a few months earlier.

"I was bored with being an employee," he says, "and wanted to try my hand at writing software." With a sister company selling business computers as a staple, White began by writing educational programs.

He soon realised that to sell his wares he would need to advertise and that it would not be economic to advertise for the small amount of software he could produce on his own. Hence the advertisement which Richardson answered, along with 10 other programmers who work for Durell Software, which is based on the barn-like top floor of a Georgian building in the heart of Taunton.

Richardson soon left his job at Aerosol International to work for the company full-time but most of the team works only part-time. "Everyone is paid from royalties." White explains, "which means they can do as much or as little as they like. It also creates a happy state of affairs in which nobody can tell anyone else what to do."

Richardson's first task for the company was to convert a fast-selling game for the Oric, **Harrier Attack,** for the 16K Spectrum. The version which Richardson wrote in a record-breaking two-and-a-half weeks soon out-sold the original — more than 17,000 copies so far compared to 10,000 for the Oric version.

Its success was due not only to the fact that more people own Spectrums than Orics. Richardson's version had a number of new features, such as a baling-out option and a hall of fame for players to enter their scores, and its graphics were far more sophisticated.

The theme also made it a prime candidate for some concerted advertising. Based loosely on the classic arcade game of **Scramble,** Harrier Attack features jets, battleships and aircraft carriers and, appearing soon after the Falklands crisis — even though White swears it is set "nowhere in particular" — the game was bound to attract a good deal of attention.

Meanwhile, Jungle Trouble, which appeared at almost exactly the same time as Harrier Attack for the Spectrum, was allowed to make its way to the top of the charts. Despite the lack of

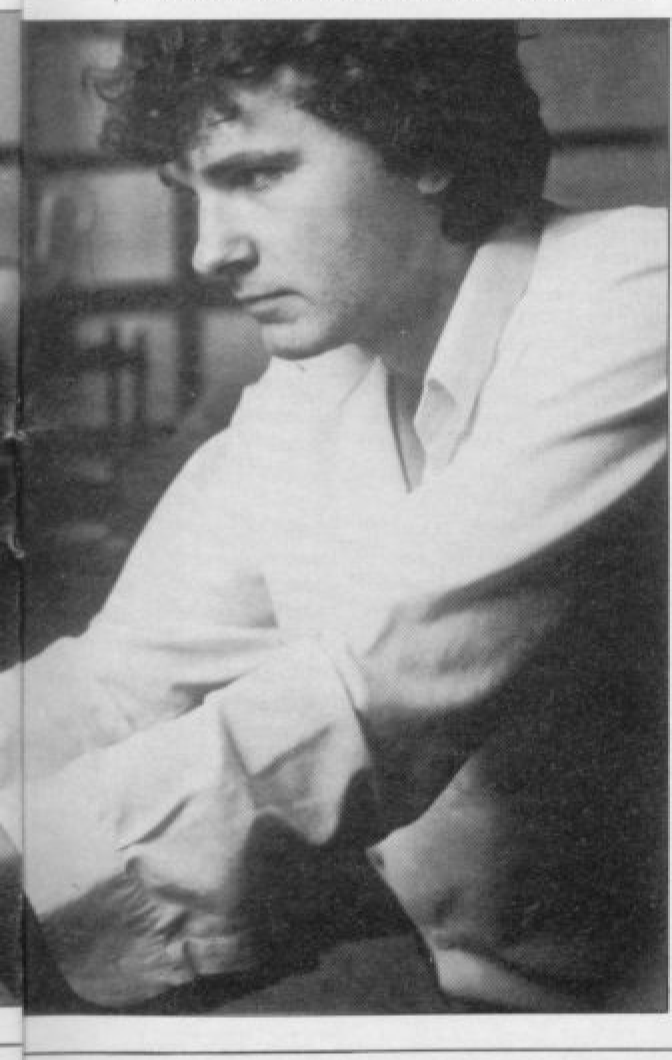


advertising, it did not remain unnoticed for long.

Although simple in concept, Jungle Trouble boasts a number of amusing details which stamp it as out of the ordinary. At the start, the three monkeys which perpetually harass the explorer run on to the screen and line up on the left, followed by three little stick men, representing the explorer's three lives, who line up on the right.

True to life, the explorer's axe becomes blunt as he chops down trees, so that he keeps having to return for a new one. Best of all are the graphics, with the hero leaping over stepping stones, chopping down trees and scuffling with monkeys in a most realistic way. Whenever he falls into the river, he does so head over heels, and it is worth persisting with the game just to see him swinging on his rope over the pit of fire.

Richardson, who claims he cannot draw, says there is no secret to creating good computer graphics. "All you need is loads and loads of graph paper," he says. Nevertheless, he persuaded his wife to run up and down the road to make sure the explorer's running movements were depicted accurately, and took endless pains over the 12 pictures needed to show him falling head over heels into the crocodile-infested river. Altogether, the graphics for the game occupy about 3K of memory and absorbed much of the two months Richardson needed to finish the program.



Richardson cannot explain what lies behind his computing skills. He had a steady but undistinguished career at his Wellington comprehensive school, where he loved chemistry and hated sports. "I was only average at mathematics," he says, "but contrary to what most people think, you do not need to be a mathematical genius for computing unless you intend to write mathematical programs."

After passing seven O levels, Richardson left school at 16. "It never occurred to me to stay on for A levels," he says, "and nobody suggested it." He continued to study chemistry on day-release from his job and is following a degree in the subject with a project for his MSc.

"You do not need to be a mathematical genius for computing"

Richardson was introduced to computing when he was working in the quality control department at Aerosol International. The manager of the department asked him to write two simple programs for the analysis of laboratory results on the company's Hewlett-Packard machine. Later, when the machine was replaced by two Pets, intended for what Richardson calls "a bigger and better" computerised weighing system, he wrote the program for that, too. Then he was "totally hooked".

Richardson's first computer of his own was a Science of Cambridge MK 14 kit which cost £39. It had 256 bytes of memory and a tiny ½K monitor but Richardson says that this predecessor of the ZX-80 was the best possible introduction to computing.

"It was only a bare board, so you could see exactly what was happening," he explains. "It was programmable in machine code, which meant I could use that before I knew Basic — an excellent grounding."

Richardson bought a ZX-81 as soon as it was launched but says he never really took to it and he sold it as soon as the Spectrum appeared. He feels the Spectrum is excellent value, even though the long-delayed delivery of a Microdrive, which he was anticipating when he bought the machine, has been a sore point.

His programming and chemistry studies take most of his time, leaving little for any other hobbies or interests. "Previously, chemistry was my work and programming was my hobby. Now it is the other way round," he says. He still hates all forms of sport and very rarely plays other people's computer games but that does not prevent him having firm ideas on what constitutes a good game.

"The main thing is for a game to look good," he says. "It must also have some objective and provide a wide range of skill levels, so that you can always reach that objective, however inexpert you may be."

Richardson claims he is a player of only moderate skill. "I used to be able to play Jungle Trouble very easily but then I decide to make it more difficult and even I have difficulty with it now."

Durell Software has high hopes of Richardson's latest production, a game called **Scuba Dive,** which occupied him for four months before it was released in December. The game features a diver who plunges to unfathomable depths, avoiding sharks, squid, electric eels and shoals of fish. Scattered about the ocean bed are huge clams and oyster shells containing pearls, which score points when you pick them up, and at the bottom, in a cavern guarded by a giant octopus, is a treasure which represents even more points.

The graphics of the game bear the unmistakable stamp of Richardson's blend of humour and realism. The diver's legs paddle, the fish move their tails, the electric eels emit sparks, and the shark swings round in a frightening three-dimensional way. The cursor keys move the diver much as he would move in real life under water — clockwise and anti-clockwise rather than in straight lines — and if he hits his head on the rocks, play ceases for a few moments while he recovers consciousness.

Richardson, whose wife is expecting their first baby, hopes to be able to pay off the mortgage on his house from the proceeds of his games but he still sometimes wonders if he did the right thing in giving up a safe, secure job for the uncertainties of the software world.

Nevertheless, he has no worries about the immediate future. "I do not see why computer games should not continue to sell well," he says. "After all, the record business is still flourishing." Nor does he think the future is bleak for small software companies with only a minimum of capital and equipment.

"Anyone can write a good program," he says with typical modesty. "All it takes is a computer and plenty of patience."

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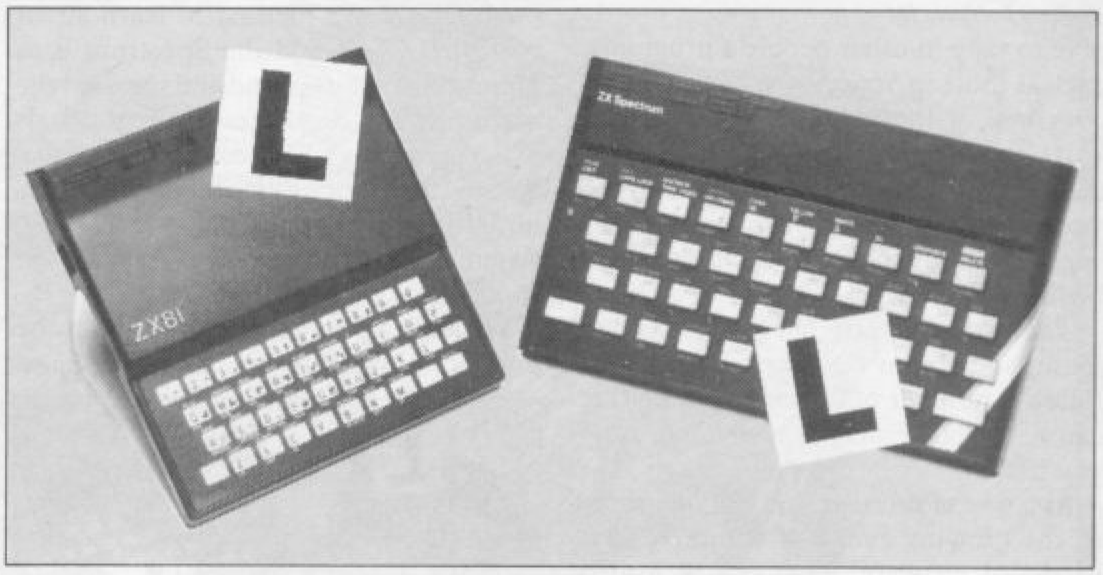
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson. Recent changes in the ULA should make more sets compatible.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 104

continued from page 103

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

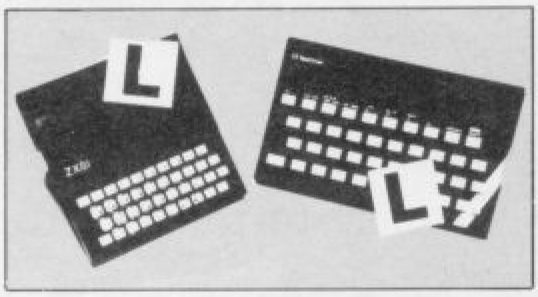
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then rewind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

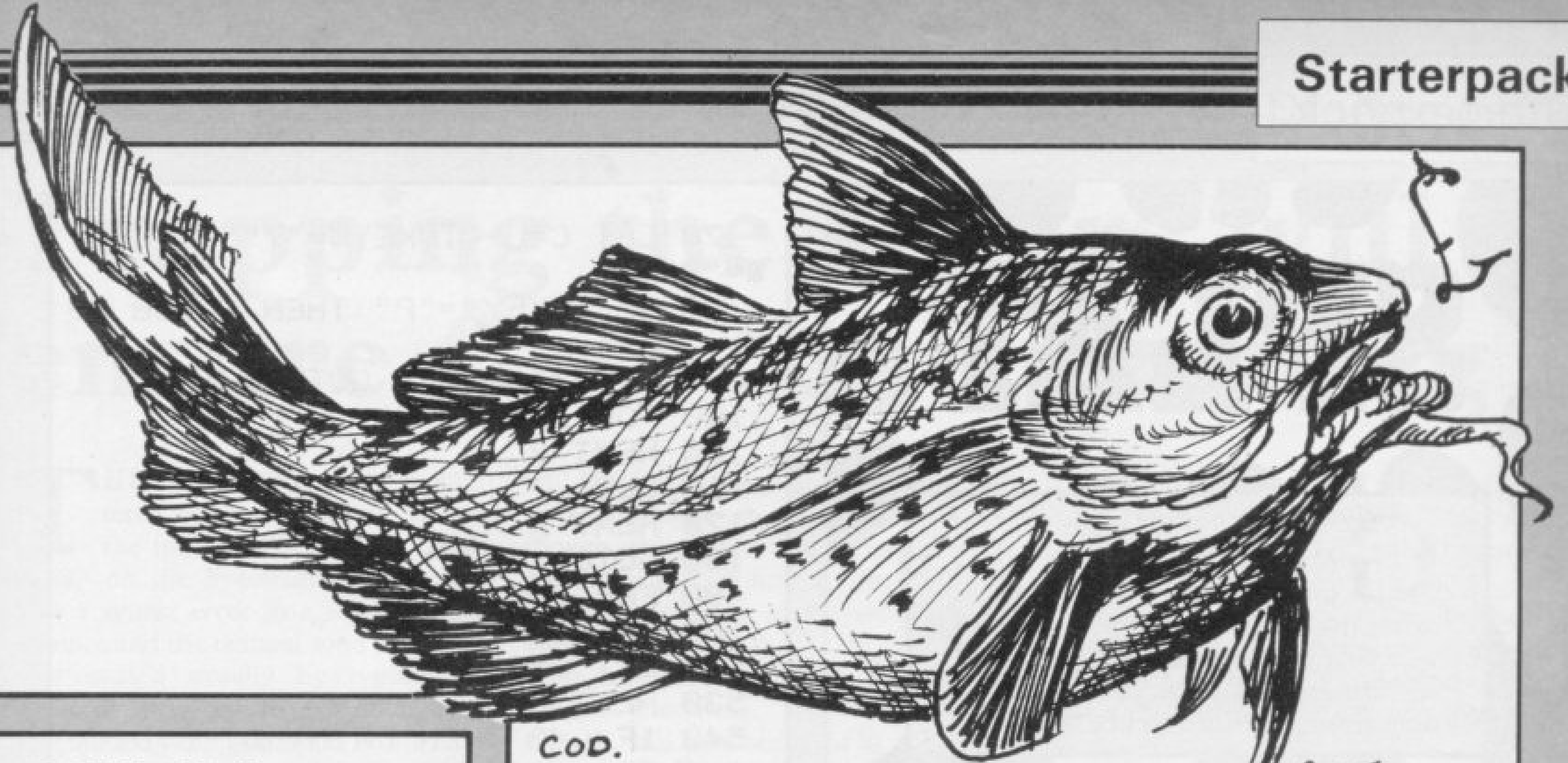
Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.

DONALD DUCK



ROBERT HENSON of Gunthorpe, Peterborough has written **Donald Duck** for 16K Spectrum. Run the program and it draws your very own Donald.

```
   1 INK 7: PAPER 0: BORDER 0: C
LS
   2 PLOT 148,76: DRAW 4,30
   3 DRAW -14,18,PI/2
   4 PLOT 99,78
   5 DRAW 1,28
   6 DRAW 18,17,-PI/2
   7 PLOT 116,119: DRAW 24,1,-PI
/2
   8 PLOT 120,124
   9 DRAW 0,6
  10 DRAW 12,1
  11 DRAW 0,-6
  12 DRAW 0,6
  13 DRAW -4,16,PI*1.7
  14 PLOT 130,151
  15 DRAW -9,-21,PI*1.6
  16 PLOT 109,128
  17 DRAW -26,-30
  18 DRAW 0,4
  19 DRAW -4,-2
  20 DRAW 25,29
  21 PLOT 133,59
  22 DRAW 16,6,PI/4
  23 DRAW 1,10,PI/2
  24 DRAW -23,4,-PI/2
  25 DRAW 0,26,-PI/12
  26 DRAW 18,0,-PI/1.3
  27 DRAW 0,-27,-PI/12
  28 DRAW -10,-5,-PI/1.5
  29 DRAW 9,13,-PI/2
  30 PLOT 108,59
  31 DRAW -10,8,-PI/4
  32 DRAW -1,10,-PI/2
  33 DRAW 26,4,PI/2
  34 DRAW 0,27,PI/13
  35 DRAW -18,0,PI/1.3
  36 DRAW 0,-27,PI/13
  37 DRAW 5,-7,PI/2
  38 DRAW 1,0
  39 DRAW 11,12,-PI/2
  40 PLOT 104,61
  41 DRAW 4,-22
  42 DRAW 24,0,PI/15
  43 DRAW 8,20
  44 DRAW -2,0
  45 DRAW -7,-18
  46 DRAW -20,0,-PI/15
  47 DRAW -4,18
  48 PLOT 100,71
  49 DRAW 46,-3,PI/3
  50 PLOT 119,64
  51 DRAW 3,-11
  52 DRAW 6,10
  53 STOP
  54 SAVE "DONALD" LINE 0
  55 RUN
```

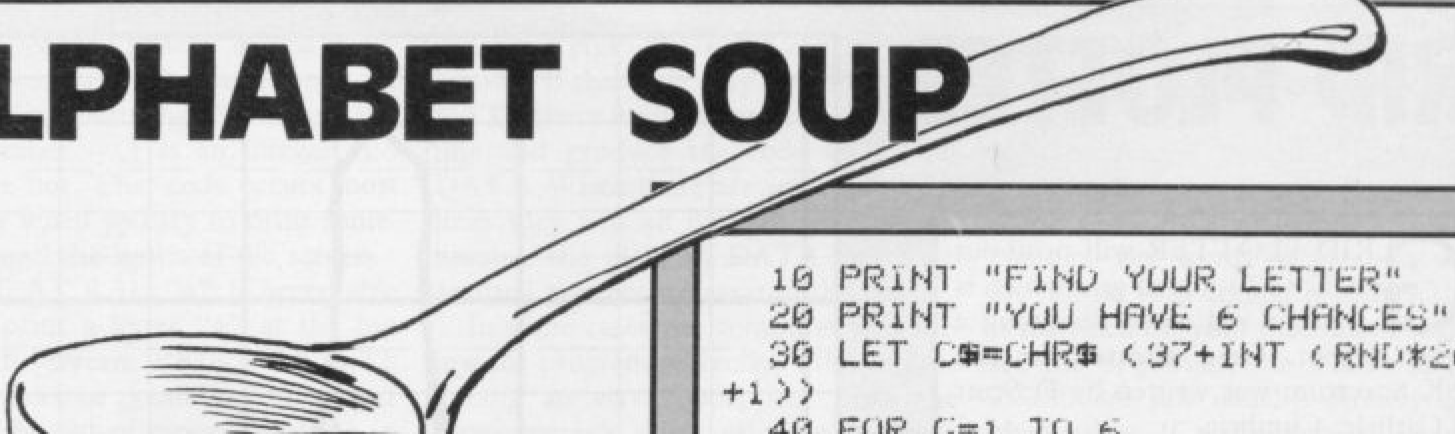


angling

```
  10 FOR Z=1 TO 43
  20 PLOT 0,Z
  30 PLOT Z,0
  40 NEXT Z
  70 LET A=INT (RND*20)
  80 LET B=INT (RND*21)
  90 PRINT AT A,B;"*-iv-*"
 100 PRINT AT 20,12;"WHAT ANGLE
OF FIRE ?"
 110 INPUT A
 120 PRINT AT 21,6;A;" DEGREES"
 130 FOR N=1 TO 43
 135 IF (TAN (A/180*PI))*N>40 TH
EN GOTO 160
 140 PLOT N,(TAN (A/180*PI))*N
 150 NEXT N
 160 PAUSE 250
 170 CLS
 180 GOTO 10
```

ENTER the angle in degrees, from nought to 90, and cast your rod into the lake. If you are correct you will catch the fish. **Angling** was written for 1K ZX-81 by J Crick of Huntingdon, Cambs.

ALPHABET SOUP



ALPHABET SOUP for the 1K ZX-81 was written by Charles Bissel, aged eight, of Cockermouth, Cumbria. Guess the letter chosen by the computer. You have six chances and a clue as to whether the chosen letter is higher or lower in the alphabet.

```
  10 PRINT "FIND YOUR LETTER"
  20 PRINT "YOU HAVE 6 CHANCES"
  30 LET C$=CHR$ (37+INT (RND*26
+1))
  40 FOR G=1 TO 6
  50 INPUT A$
  60 IF A$=C$ THEN GOTO 110
  70 IF A$<C$ THEN PRINT "LATER"
  80 IF A$>C$ THEN PRINT "EARLIE
R"
  90 IF G=6 THEN GOTO 160
 100 NEXT G
 110 PRINT "CORRECT-DO YOU WANT
TO STOP OR  HAVE ANOTHER GO"
 120 INPUT B$
 130 IF B$="STOP" THEN STOP
 140 CLS
 150 IF B$="ANOTHER GO" THEN RUN

 160 PRINT "WRONG-DO YOU WANT TO
STOP OR HAVE ANOTHER GO"
 170 GOTO 120
```

SPLAT

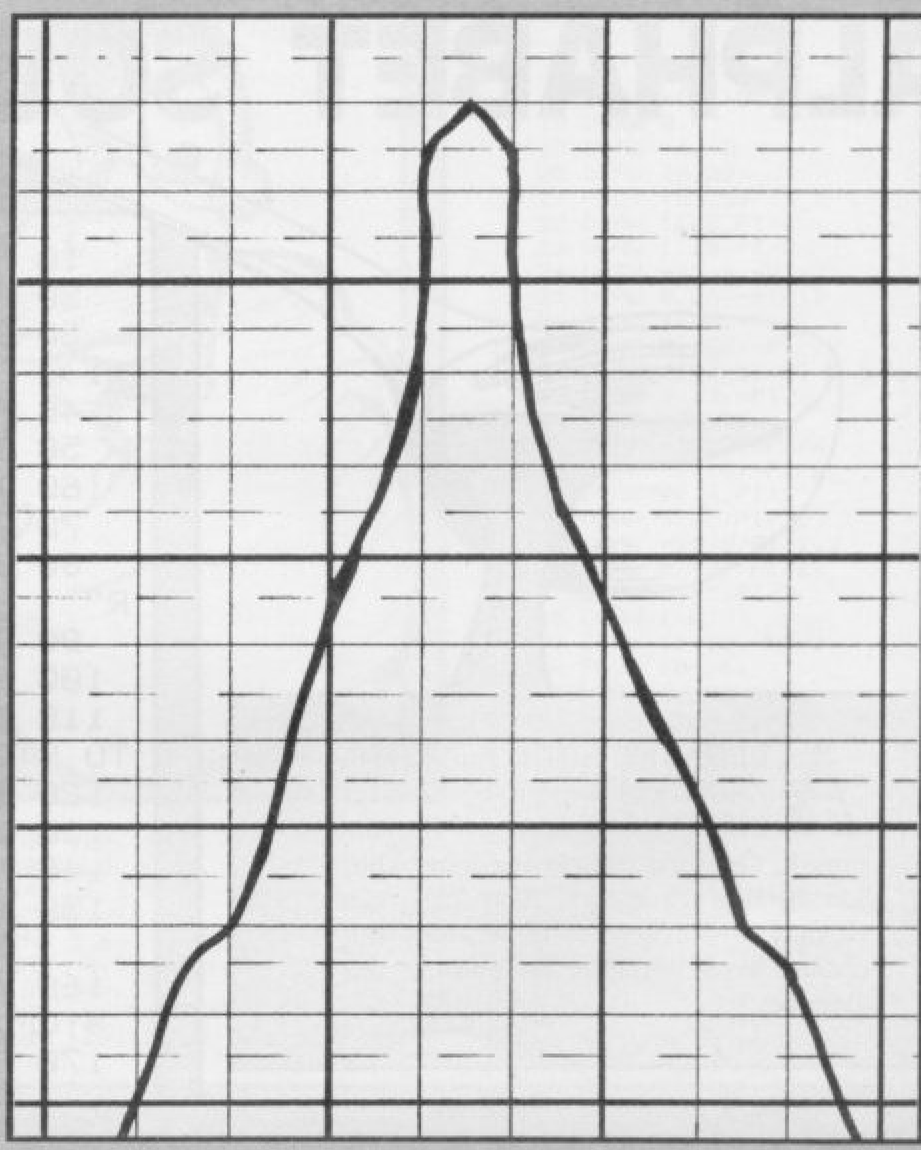
G GARDNER, aged 13, of March, Cambs. wrote **Splat** for the 1K ZX-81. The object is to hit the monster (inverse") 10 times with your pistol (graphic "e"). If you do not manage to kill the monster in the time given, the score will be displayed.

```
  2 LET S=0
  5 LET C=11
 10 LET A=11
 11 FOR R=1 TO 100
 13 LET D=0
 15 IF A=21 OR A=0 THEN LET A=1
1
 30 LET B=INT (RND*2)+1
 40 IF B=2 THEN LET A=A-1
 50 IF B=1 THEN LET A=A+1
 55 PRINT AT A,16;"(i")"
 60 PRINT AT C,0;"(9e)"
 70 LET C=C-(INKEY$="7")+(INKEY
$="6")
 80 IF INKEY$="P" THEN GOSUB 49
0
 90 IF S=10 THEN GOTO 1000
100 FOR Z=1 TO 30
105 NEXT Z
110 CLS
120 NEXT R
130 GOTO 1000
490~FOR F=0 TO 16
500 PRINT AT C,D;"."
520 LET D=D+1
530 NEXT F
540 IF C=A THEN PRINT AT C,D;"(
*i* 2*ix:2*i*)"
543 IF C=A THEN LET S=S+1
545 FOR Q=1 TO 50
546 NEXT Q
550 CLS
560 RETURN
000 PRINT "MONSTER SPLATTED"
010 FOR X=1 TO 50
011 NEXT X
020 CLS
030 PRINT "YOU SCORED ";S
040 STOP
```

GRID PLOTTER

GRID PLOTTER will print-out a 32×32 squared grid which is a useful aid when designing a screen layout. **Grid Plotter** for the 16K Spectrum was written by D Scott of Carlisle, Cumbria.

```
 10 REM LAYOUT PLOTTER
 20 PLOT 255,175
 30 DRAW 0,-175
 40 PLOT 0,175
 50 DRAW 255,0
 60 LET x=32
 70 LET y=22
 80 FOR y=0 TO 175 STEP 8
 90 PLOT 0,y
100 DRAW 255,0
110 NEXT y
120 FOR x=0 TO 255 STEP 8
130 PLOT x,0
140 DRAW 0,175
150 NEXT x
```



Trapping the errors will ensure first-time running

THE FIRST error code encountered by most Sinclair users is the flashing "S" on the ZX-81 or "?" on the Spectrum, which indicates a syntax error in a sentence. Experience and the manual soon show that it is caused usually by typing-in a keyword letter by letter, or by bad punctuation, for example omitting a semi-colon or an inverted comma.

The most frequently-occurring error code is "2" — variable not found. A variable is a letter which has been given a numeric value. When you enter "LET a=2" you are defining a variable. Error code 2 results when the computer reaches a variable in the program to which you have so far given no value.

Check the line which the computer specifies. If it is your program, give a value to the variable or remove it. If you are copying the program, look back in the listing to see which line you have missed.

Although the majority of error codes are explained adequately in the manuals, the report "B-Integer out of range" can be confusing. An integer is a whole number — 1 is an integer, 1.5 and 1½ are not. That code occurs most frequently when you try to print something beyond the limits of the screen.

PRINT AT 0,31; "a" is acceptable and will print a letter "a" at the top right of the screen. PRINT AT 0,32; "a" would not be possible. The integer 32 would be out of range, resulting in error code "B". That would also happen if the computer were instructed to PRINT AT 0,31;"ab". It would still be trying to print a character beyond the limits of the screen.

That error is more difficult to detect if variables have been used as co-ordinates and your character, or series of characters, is being printed in varying positions. If the instruction PRINT AT 0,x;"a" produces report code B, make sure that the value of x never increases beyond 31.

On the Spectrum "B-integer out of range" is also often found when you are POKEing-in user defined graphics. The biggest number which can be POKEd-in this case is 255 or BIN 11111111. In that case the error code will occur in the line containing the POKE statement. In most cases, though, the error will have occurred in one of the DATA lines in the program.

A very frequent error code produced on the Spectrum is "E-Out Of Data". That will occur in a line containing a READ statement. The error code, though, will have occurred in one of the program DATA lines, which may be nowhere near the READ line. A READ command sends the computer to a DATA line to collect the next piece of DATA contained there. That is often done using a FOR, NEXT loop, especially when graphics are being set up.

FOR n=1 TO 8: READ n will send the computer to the DATA lines eight times, for eight separate pieces of information. If there are only seven pieces of DATA there it will return to the READ line and produce the code OUT OF DATA. When there are several DATA lines they will all have to be checked, because the piece of DATA you have omitted was not necessarily the last.

In some cases the computer will follow the program correctly, without producing an error code, but from the programmer's point of view the program contains an error. In that case BREAK into the program at the moment it goes wrong. That will produce report code 9 and the line on which you have STOPped the program. That method makes it easy to locate the area of the program which contains the error.

Programs which you copy from magazines, books or from friends can be difficult to error-trap because they contain programming techniques which you have not yet learned, or simply because it is often difficult to follow another programmer's logic.

The flashing "S" or "?" indicating a syntax error may appear frequently. In that case check carefully what you have copied. You may not have recognised words such as LN or EXP as keywords.

On the ZX-81 especially it is easy to forget that pressing "π" will produce the word PI.

Make sure that when the "is not equal" sign, "< >" appears in a listing you always enter it as one character and not as "is less than", "<" followed by "is greater than", ">".

Technical problems can also cause errors in programs. Any alteration to the power supply can cause a program to CRASH. In that case the screen display may change dramatically and using the keyboard will have no effect. The only solution is to unplug your computer and begin again, making sure that your power supply and RAM pack are both connected firmly. That error is caused by the computer and not by the program.

> 'The error need not be on the line which produces the report; that is simply the line where the computer meets the problem'

Sometimes a program listing in a book or magazine will contain what seems to be a very obvious error. If it contains key words or symbols which are not on your computer, check that it is intended for your machine. Programs for the Spectrum, the ZX-81 and the ZX-80 are not usually directly interchangeable. If a program contains the command GOTO or GOSUB — a non-existent line number — the computer will simply go to the next numbered line after that one. That is a sign that a program has been developed and improved and is rarely an error.

When you have errors in a program, first check the report codes listed in Appendix B of the manual. It may then be necessary to read the appropriate section of the manual. Remember that the error is not necessarily on the line which produces the report code; that is simply the line where the computer meets the problem for the first time.

Always check carefully every line connected with the line containing the error code and the mistake should be easy to locate.

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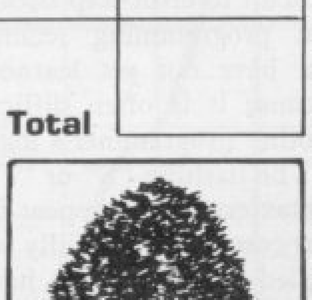
I wish to order the following programs.

N.B. As we expect heavy demand please indicate alternatives if possible

Qty	Title	Price

Postage, packing and handling: add 45p for the first cassette, and 25p for each additional cassette. Non-UK orders add extra 50% for postage

Total



I enclose a cheque/postal order for ____________

Name ____________

Address ____________

____

(Allow 28 days MAXIMUM FOR DELIVERY)

Spectrum language joins the family

John Gilbert assesses a new package

THE MICRO-PROLOG language package from Sinclair Research has arrived at the appropriate time to give a new direction to the software market.

The term Micro-Prolog is short for microcomputer programming in logic and the language is one of a new generation which could be termed, under certain circumstances, artificially intelligent. That means that the computer will appear to give intelligent answers to questions which it is asked.

From that description of intelligence you should be able to see that Micro-Prolog is nothing like Basic. In Basic you would write a series of commands which you would then expect the computer to execute in a sequence. Micro-Prolog, however, expects a series of rules, rather like those built into a database. The rules can relate to each other or be entirely separate.

The language will provide answers to any questions you might pose to the computer which relate to the rules you have entered into the language database. Even though it is capable of artificial intelligence, the language will not be able to answer your questions if it has no rule to deal with them. Neither can it make assumptions or draw conclusions without those rules.

To aid the construction of your programs there are several utilities in the package. One is called Simple and it will convert the base language into a language which a beginner can use. It does so by adding command words to the database which will make the task of programming easier for the user.

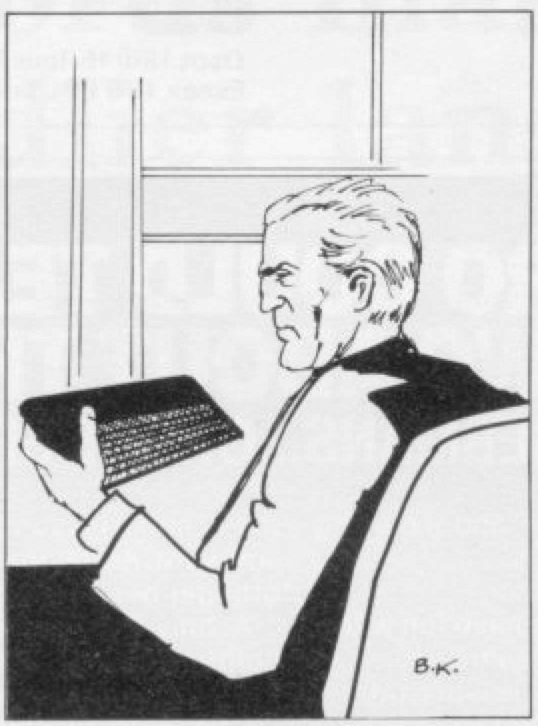
Prolog programs are loaded in a different way from those written in Basic on the Spectrum. The computer will load software in blocks and the block numbers will be displayed for each, along with the message 'BLOCK OK' or a read error which will break the loading process.

Once Simple has been entered you will be ready to write some rules. You could, for instance, build some rules about a family and the relationships in it.

The family could include Clive, Mary, Robert and Rebecca. If the computer is to answer questions about those people it must first have a set of rules to which it can refer. They would include Robert is the brother of Mary, Clive and Rebecca; and Mary is the sister of Clive, Robert and Rebecca. Those rules would be entered for each of the family members.

The rules have to be converted to a form of understanding of the language. Robert is the brother of Clive would be translated into add (Robert brother-of Clive). The middle name is the relationship between Robert and Clive and must consist of one word, hence the hyphen.

It is also possible to qualify a data name such as that of a member of a family with several tags which would



identify it further when the database is interrogated. To do so we can use a statement which consists of one data name and one relation name. You may want the language to know that Robert is male or that Rebecca is female. To do that you would type add (Robert male) and add (Rebecca female).

To query the database you can use several commands, including 'is' and 'which'. The 'is' command is used to test if a statement is true or false. We could ask the question 'Is Mary the sister of Rebecca?' The computer could then give a YES or NO answer. It will give a NO answer in two cases — if the statement is false or if the statement rule does not exist in the database.

The other query command is 'which' and that is more flexible. It will allow you to find the relationship between one item in the database and another. With the 'which' command you need to know only one of the items. For instance, if you want to know who is Rebecca's sister you would use the form which (x:x sister-of Rebecca). The x specifies the unknown quantity, as in algebra, and in this case it refers to a sister Rebecca might have.

When that command is entered you should have the name of Rebecca's sister, followed by the statement 'no more answers'. That means that, using the rules it has obtained from you, the computer has found the corresponding relations in the 'sister-of' category.

Data structures such as those can be built with any kind of relationships. To fit Micro-Prolog into the definition of a language you have to stretch that definition slightly to include databases and programs which store lists of data which can be accessed depending on the user's needs. The difference is that Micro-Prolog is more adaptable to the needs of the user than a normal database written in Basic or machine code.

Although the language seems to be specialised it has several uses, two of which are the creation of databases which can be used by almost anybody and also the creation of educational teaching tools.

In the utilities line the Prolog language has been used to build a model of the London Underground system. The various stations in the network were fed into the computer and the best, and quickest, possible routes between stations were found.

Micro-Prolog can also be useful in the classroom. The database can be programmed with information about a subject and the student can interrogate the database and not have to think about what is happening in the computer.

The final test of software is whether it improves or advances the use of a computer and this package certainly does so. The only criticism is its price, £24.95, which will deter some people buying what is an example of good software.

Despite the price, Micro-Prolog will prove that the Spectrum can be used for serious purposes and that the computer has a good future in schools and other institutions.

Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS.



In the penultimate article of his series, John Gilbert explains two simple routines to make Forth easier to use

New words make for a friendlier language

MUCH has been said about the instructions which can be used in the Forth language but few comments have been made about the ways in which Forth can be used to give more understanding of microcomputers and in the world at large.

There are critics who see no use for the language and ask for more machine code but, with its entrance as the second language in GCE computer science courses, it is assuming an importance for many students and could become as important as Basic in the near future.

With the greater availability of the language in institutions such as hospitals, it has more of a status than the small cult following it had when it was introduced.

Forth can be used in hospitals for a variety of tasks which can be categorised into two essential groups. Its input/output facilities make it an ideal language for the control of sensitive devices, such as life support systems, or even in controlling the temperature of the hospital environment. It is feasible that programmers operating such a system could be doctors or nurses with some training in computers, as Forth is not so difficult to learn as, say, machine code.

A secondary use for Forth in hospitals is keeping track of patient records. They could be relayed by the user through a series of terminals to the central computer, which could be a micro of the same type as the terminals. Each terminal would share the central computer which, using Forth, could cope with the entry of huge amounts of data in a short time.

The central computer in this case seemingly would handle information from different terminals at the same time. That type of usage would call for multi-tasking procedures in the language operating system, in which several jobs can be done at once. As Forth uses a dictionary in which new words, or commands, can be defined by the user, it would be possible to produce multi-tasking facilities which would make the job of data entry quicker and more efficient. Luckily, such procedures are incorporated into David Husband's ZX-81 Forth ROM, which was discussed briefly in the previous article.

> "It is feasible that programmers could be doctors or nurses"

Forth can also be used in factories to control production lines. As multi-tasking is available with the language, it would be possible to use one microcomputer unit to control several unrelated tasks all happening at the same time.

To run systems such as those mentioned some routines have to be developed which will make the language much more friendly when the user operates it.

It would, for instance, be no use to someone knowing little about computers if the machine was expecting information but did not tell the user what to expect. Experts with the language may know how information is introduced into the system but a doctor, for example, might not.

So far we have dealt only with entering numbers on to the Forth stack. We have not attacked the entry of strings because it is slightly more difficult than typing-in a figure which the computer

continued on page 112

continued from page 111

will then put on to the top of the stack. It is possible, however, to implement a simple utility which could be used for entering data into a system such as the one used to store patient records in a hospital.

To produce that on-screen user utility program we must first enter two Forth words into the dictionary. I shall use David Husband's ZX-81 Forth in this example although, as it provides fairly standard Fig-Forth, people with Abersoft and Artic Forth should be able to do the same on their computers. It is slightly easier, however, to illustrate the point using the on-board ROM of the ZX-81 Forth package.

Figure one provides a simple Basic-type INPUT routine which will put a question mark on to the screen and

```
: INPUT CR ." ? " S@ CR ;
```

Figure 1.

expect you to enter a one-word response. Typing ENTER or BREAK after the data will put the string on to the character stack.

That stack is like the one we used for entering numbers and will accept one character at a time. Each character is converted to its ASCII code, which again is a number. The character stack behaves in a similar way to the one we have been using previously, except that it is for the exclusive use of symbols such as a, b, c.

INPUT is the name I have chosen for the new dictionary word which will act as a bridge between the user and the character stack. The first thing it will do is to generate a carriage return, or new line, using CR. The question mark, which acts as a prompt for the user, can then be displayed on the screen using the print command, '.', followed by the explanation string announcing the program which is in the usual quotation marks.

The next part of the new word is S@, which may look strange to you. If, however, you take the two symbols apart and analyse them you can see what this operator does. Look in your user manual and you will find that wherever the '@' symbol is used as a pre-fix or suffix the Forth word to which it is attached will do something with machine addresses.

The 'S' symbol can be taken as meaning string, so 'S@' will provide a link between a string of characters on the stack and the address of those characters. That gives access to the string when you want to call it back off the stack and use it on the screen.

Following the 'S@' symbol is another carriage return and the end of word marker.

```
: DISP CR CO .W CR ;
```

Figure 2.

That is satisfactory for entering words but you will also need to get the string you want off the character stack



and on to the screen. This can be done with the word defined in figure two.

The DISPlay word will output the text on top of the character stack and then return the system to the user. A carriage return prepares the computer for the output of text on a new line, although that is unnecessary, as in most cases an automatic return will be made. Again the next command can be deciphered by taking it to pieces. The CO goes back to the days of mainframe computers with their operator consoles. It means the device on which the text to

> "The routines can be used for all types of data entry"

be output is printed. In this case the screen of a television set is used. The '.' means print and W stands for 'word'. With a little thought most Forth words can be deciphered in that way.

The two words mentioned can be

```
: EXAMPLE CLS
." USER UTILITY PROGRAM "
INPUT
CLS
DISP ;
```

Figure 3.

used in their own right to make input and output easier for the user but just to show how they can be incorporated into other programs, figure three provides an EXAMPLE.

The screen is cleared, using CLS, and a prompt is given to the user. On the next line of the definition is the INPUT word, which will produce the question mark, to which the operator must respond. Once an entry has been made, remembering that it must be one word in this instance, the screen is cleared again and the string is quickly taken off the character stack ready for display on the screen. Type all three definitions into the computer, produce a permanent version on tape, and you will have a routine which mimics the Basic INPUT and PRINT routines.

To get the feel of what is happening inside the computer we must see what is happening on the parameter or number stack which we have been using until this article and the character stack to which you have just been introduced.

In ZX-81 Forth the string is stored on the character stack and a reference, or index, to its whereabouts is put on to the parameter stack. As more strings are put on to that stack the parameter stack also grows with the index addresses of each character string.

Deliberately I have introduced one of the more complex operations of the character stack first because everything from then is plain sailing. As well as taking strings off the stack we can also take off individual characters.

If we were intending to take an element off the parameter stack we would use the command DROP followed by the '.' symbol if we wanted to print it. A similar command is used to take a figure, such as 'A', off the character stack, but this time we put a 'C' before the DROP. In that way you can enter a string but take just one of its characters off the stack at a time.

The number and character routines can be used for all types of data entry to the Forth system. Number entry is slightly easier but with some simple additions to the Forth dictionary we can make it behave like Basic, at least to the unsuspecting novice user.

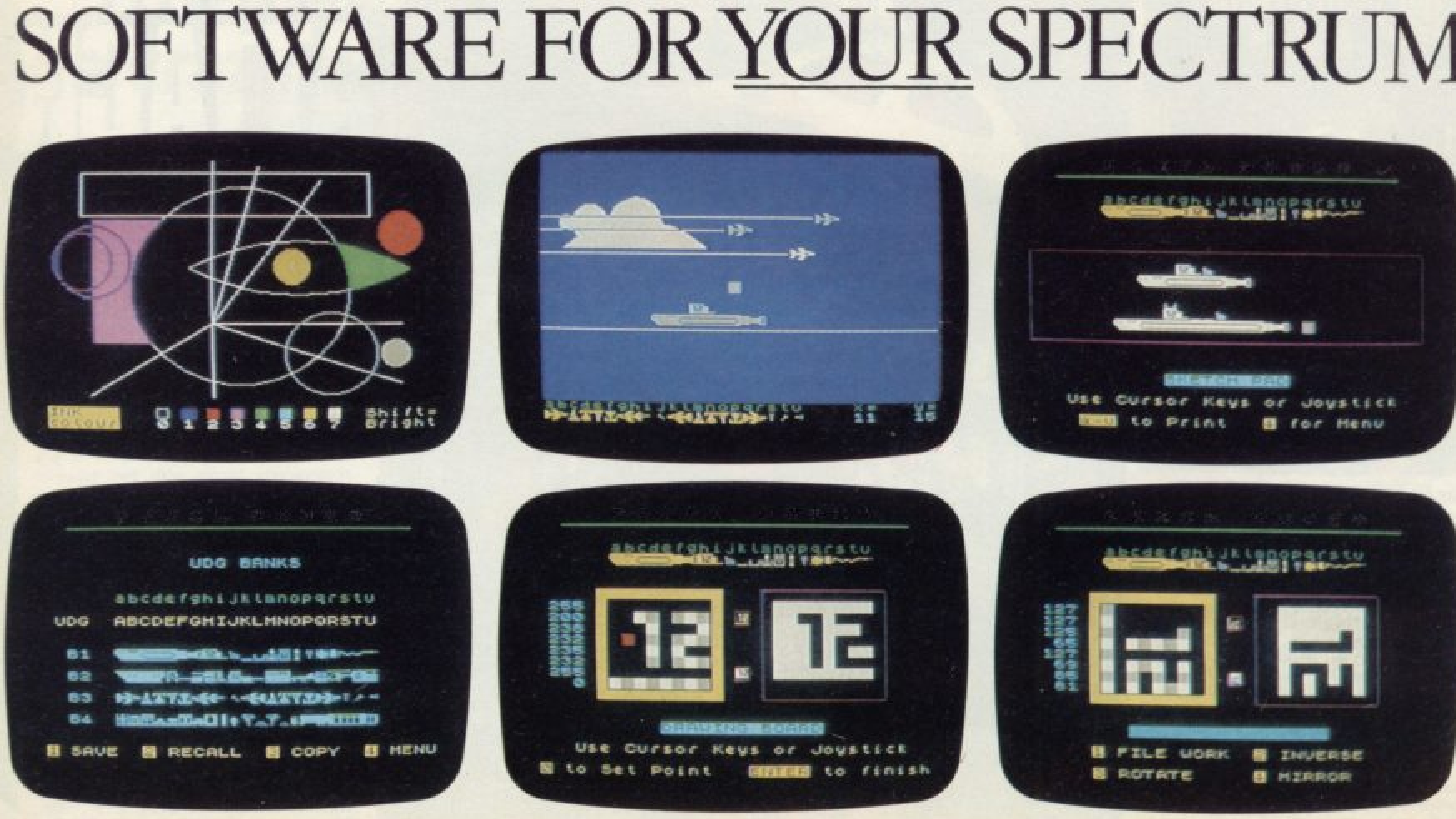
With an introduction to input and output I have dealt with almost all the important concepts used in the Forth language. Next month, in the last of the series, I shall introduce some of the more arcane aspects of Forth and explain why it is so ideal as an input/output language. I will also be delving deeper into the multi-tasking routines available with ZX-81 Forth and give some ideas as to how this popular language could develop in the microcomputer industry.



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The abc of simple keyboard drills

Theodora Wood looks at reading programs



THE USE of computers in teaching literacy skills, at a very early age and later as the child becomes more adept at recognising and communicating the written word, inevitably entails the gaining of skills with the computer. The use of the keyboard to answer on-screen questions and commands reinforces that aspect of educational computing.

That is nowhere more true than of the many alphabet programs on the market. Learning the alphabet requires not only the ability to recognise and differentiate between shapes but also to match shapes to their appropriate sounds. Without an adult to speak the sounds, the alphabet games become merely a matter of keyboard training. **Letters and Numbers,** Jimjams Software, Spectrum 48K, £4.95, is an example, where the child has to press the matching key to the letters which appear on the screen. If correct, the picture appears with sound and animation, unlike **Alphabet** — Widgit, Spectrum 48K, £5.95. The use of voice synthesisers should alleviate this problem somewhat.

abc . . . Lift Off — Longmans, Spectrum 16K, £7.95, is slightly different in that the child has to match a picture to a word and its initial letter in a game of snap; the child has only to press S to indicate a match. When six correct answers have been given, a rocket takes off. The action takes place quickly and is best-suited to be used as a consolidation routine, after a child has a knowledge of the shapes and sounds of the alphabet.

Alphabet Games — Blackboard Software, marketed by Sinclair, Spectrum 48K, £7.95, immediately seems better value in that there are three games in the one program. There is also the possibility of customising the program or incorporating routines from it into programs a parent or teacher may be writing, and the cassette gives hints on that.

Blackboard has allowed for that in all its programs, producing a degree of flexibility not found in other software. Once LOADed, the program offers the choice of three games, **Random Rats, Invaders** or **Alphagaps.** After the child's name is entered, there is then the choice between upper- or lower-case letters. The speed is fast, and can obviously be changed, but that adds to the arcade-style fervour of both Random Rats and Invaders. Both games are unashamedly keyboard trainers, matching lower- and upper-case letters. If played with a child who shouted the sounds while a parent types them it can prove to be a good practice session on this level.

In Random Rats, rats appear on the screen at intervals and a white block, the gun, moves across the screen. The child has to press the letter which appears on the gun to zap a few rats. In Invaders the child has to press the letter which appears on the alien spaceship to prevent it landing by blowing it up. At the end of both games the player receives a certificate if a ZX printer is attached.

The third program in Alphabet Games features training in another kind of skill that is the order of the alphabet,

> "The programs have little connection with real life"

important in the use of indices for filling and retrieval purposes. Alphagaps shows the alphabet on the screen with some missing letters. The child has to fill the gaps with the correct letter from left to right.

Sinclair has also released five programs recently which foster the whole word approach to reading as well as the use of the alphabet. **Learn to Read 1-5** — Sinclair, Spectrum 48K, £9.95 each, provide a range of activities with a structural approach to teaching the reading process.

All the programs feature the animals from the reading scheme, Meg the hen, Sam the fox, Jip the cat, and so on, and are very simplistic in their textual content. The year 1950 was, after all, pre-television for most children and the lack of sophistication is evident in 1984. They eschew such criticisms as sexist, which are directed at many of their contemporaries such as Janet and John, but overall have little connection with real life.

Learn to Read 1-3 runs on a roughly similar format. Once LOADed, the menu appears, a box moves over the names of the activities and the child has to press a key when the box surrounds the chosen task. **Names** introduces new words on all three programs, ranging from the names of the animals to the last word in a sentence containing the words learned in previous programs. Those are shown at the beginning of the program to be read by an adult and then tested. In Learn to Read 1, one animal is left on the screen with a list of all the names; the child has only to press a key when the moving box is over the correct word. By the time Learn to Read 3 is attained the same task includes reading a sentence and matching two words with objects which appear at the top of the screen. If correct, the word is written in big lower-case letters.

Kim is the next program on the menu increasing in difficulty over the range. It is a simple memory game where pictures with words or sentences appear on the screen and then one disappears. The child has to spell the word on the keyboard; if correct, the picture and the word appear again. That is repeated until all the words have been tested.

Spell, the next game, is repeated on all three programs. In one all the animals appear on the screen and then each



is labelled in turn; the child has to spell the word on the keyboard. After five attempts the computer gives the correct letter. In Learn to Read 2 bars of labelled colour appear at the top of the screen and then a sentence appears on the lower half, for example Meg the ---, and the child again has to spell the word; if correct, the animal is coloured by a dripping pot of paint and the sentence is completed, Meg the hen is yellow. A score bar builds at the side of the screen with each colour. Learn to Read 3 provides the child with a multiple choice of similarly-spelt words to fill the gaps in a sentence. A similar score bar operates as in the previous program.

The final choice on all three programs is a version of the perennial educational game pairs, called **Card.** Over the span of the three programs the number of cards increases from eight to 12, from matching pictures, through matching pictures and words to matching pictures with their initial sounds — the first introduction to phonics in the whole scheme. The child has to ENTER the numbers of the cards to turn them over.

Learn to Read 4 is devoted to teaching alphabetical order and is much more accessible than the previous activity discussed, Alphagaps, found on the Blackboard Alphabet Games. There are three choices — NEXT, MIDDLE and FIND. NEXT shows the complete alphabet, upper- and lower-case, printed to a catchy tune. Three letters appear on the screen in alphabetical order and the child has a picture clue to help ascertain the fourth letter, as well as the alphabet at the top of the screen.

In MIDDLE the child is presented with three boxes, the outer two of which contain pictures and letters and the child has to guess the middle letter. After five incorrect attempts at either of the activities, the letter is given. FIND can be slow or fast — pictures in alphabetical order move across the screen; when there is a gap the child has to press the appropriate letter on the keyboard. At the end there is a house with the entries missed in the windows.

The fifth tape is a series of examples and exercises to aid the learning of all those positional words, such as on, top, bottom. These words, although common in written text, often prove a stumbling block for early readers.

As all the programs are based on the same animal characters, it is more difficult to imagine using the useful routines found in such a program as Learn and Read 4 out of context, and Fisher-Marriot has allowed no provision, unlike Blackboard, for doing so; CAPS SHIFT BREAK causes the program to crash. Also because the scheme relies almost completely on three-letter words, there can sometimes be nonsense sentences for the child to complete.

For older children, **Star Reader** — Scisoft, Spectrum 48K, £6.95, is aimed at the six-to-11 age group and provides training in the meaning of words and their position in the context of a written piece of text. There are three levels of reading difficulty and two choices of activity. At each level a passage of text

> "Exposure time can be regulated to suit the child concerned"

is shown on-screen with some words missing; the child has to ENTER the words from a choice given at the bottom of the screen. At level one the second choice of activity is to sort jumbled sentences, while the alternative choices for levels two and three concentrate on dictionary skills and filing activities, both useful for information searches.

Castle Spellerous — Blackboard, Spectrum 48K, £7.95, flashes the word on the screen before the child has to spell it. The object is to release the princess from the wicked magician's palace. It is well-realised graphically and interesting, with sudden surprise attacks fended-off by pressing the appropriate letter on the keyboard. There is a choice of 10 types of words, for example 'ea' words; the word lists can be changed and the exposure time to the word can be regulated to suit the child concerned.

Scisoft has produced a similar package in **Wizard Box** — Spectrum 48K, £6.95, — the words do not flash on the screen but can be recorded on tape. The problem of synchronisation could become acute for a child not accustomed to tape recorders. **Hangman** programs, either typed from books or akin to the version found in **Punctuation Pete,** are probably just as effective and interesting as a spelling tester.

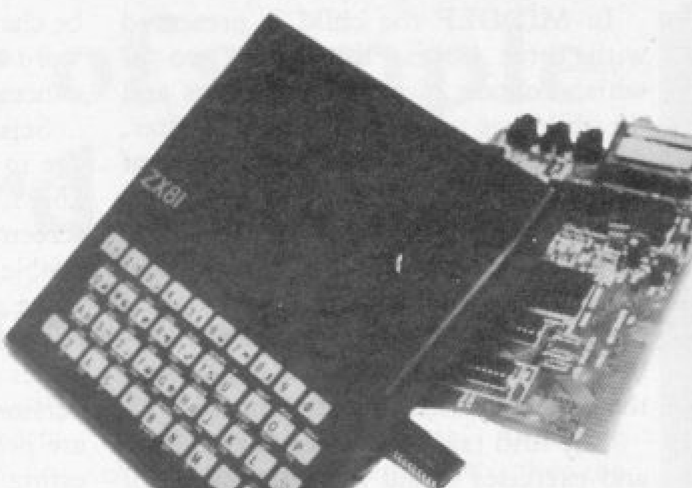
Blackboard has also released four programs to help with punctuation — **Capital Letters, Early Punctuation, Speech Marks** and **The Apostrophe** Spectrum 48K, £7.95. The titles give an obvious hint to the contents. All the programs give examples of the use of punctuation and then test the child with a piece of text on which to practise.A little stick man moves over the text and the child has to stop him at the correct place to insert the punctuation marks.

If a ZX printer is attached, a certificate is printed with the number of correct answers and at the end of each set of activities there is a game. Heinemann has covered this ground with one program operating on three levels, Punctuation Pete. Unlike the Blackboard programs, there is no opportunity to change the text and it is therefore a much less flexible package.

Finally, **40 Education Games** for the Spectrum, by Vince Apps, Granada, £5.95, is a cheap way of providing programs in this field. It includes a spelling test, Hangman, and speed reading as well as mathematics routines.

All the programs reflect current educational emphasis on drill and test, and are electronic workbooks. They familiarise a child with the keyboard but often than that offer very little which is new. A more creative approach in the field would be to concentrate on the computer as a writing tool, as adults would use it, to refine and correct a piece of written work.

Heinemann, 22 Bedford Square, London WC1B 3HH.
Jimjams Software, The Radleth, Plealey, Pontesbury, Shrewsbury SY5 0XF.
Longman Software, Longman Group Ltd, Longman House, Burnt Mill, Harlow, Essex CM20 2JE.
Scisoft, 5 Minster Gardens, Newthorpe, Eastwood, Notts.
Sinclair Research, 25 Willis Road, Cambridge CB1 2AQ.
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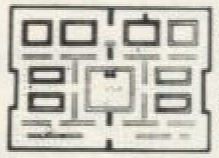
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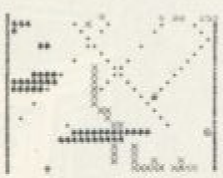
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These programs were developed for use in a Junior School and have been in regular use there for some time. Older people also find them interesting and fun.

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16K version commands include: forward, left and right through a specified angle, wipe, pen up and down, paper and ink colour, macro, edit.
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REVEAL: an addictive 16K word game. A piece of writing has had its letters rubbed out and you have to find out what they are. You buy letters or try to predict them. Included are 20 textfiles to be solved and a textmaker which will let you input your own text and store it on tape for someone else to solve.
EQUATION INVADERS: a 16K game to make simple equations more interesting.

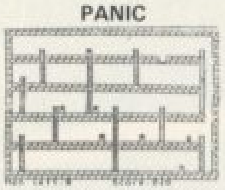
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CENTIPOID (machine code).
Centipoid is a full-feature arcade game with mushrooms, spiders, webs, scorpions, gobblers, indestructible dead segments of centipoids that drop down on you, and, of course, the centipoids themselves.
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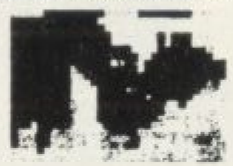
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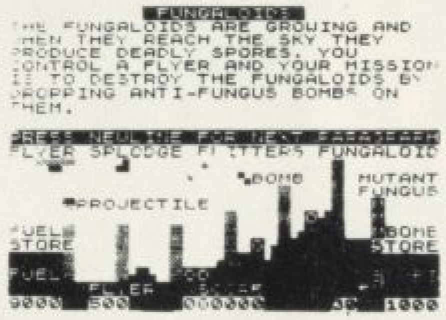
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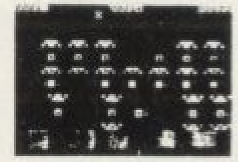




GUNFIGHT (machine code)



INVADERS (machine code)



GALAXY INVADERS (machine code)
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"quantity as well as quality"
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"if each game was on a separate tape and selling for £5 each I would still recommend them"
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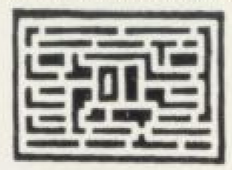
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7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available form J. Steadman).

CASSETTE 5 8 games for 16K ZX-81 £6

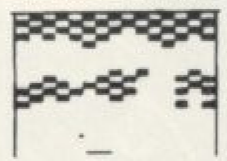
BYTE-MAN (machine code)
(previously available from Mindseye)



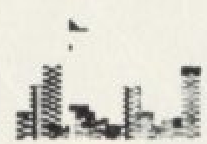
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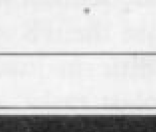
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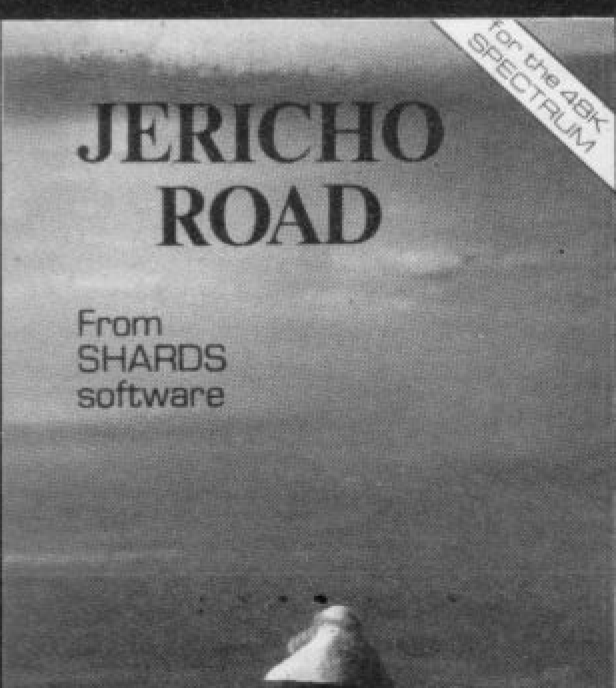
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Andrew Hewson helps you to iron out difficulties with the ZX-81 and Spectrum

Simple hints on some common complaints

RECENTLY I have been working on a book which is based on a compilation of all the columns I have written and it has given me the opportunity to review all the letters I have received. It has been an interesting task. Initially the letters, except for a few on the ZX-80, were about the ZX-81, because the magazine was launched in April, 1982 before the Spectrum was announced. From September, 1982 the number of Spectrum letters gradually increased and nowadays the ratio is about two to one in favour of the later machine.

The sophistication of the questions has also improved. In the early days most readers were interested in the details of Sinclair Basic, or wished to know how to PEEK and/or POKE the display. Now, there is usually a fair proportion of questions from readers who clearly already possess a reasonable knowledge of the Sinclair ROM.

One observation stands out from an analysis of all the letters I have received — that about 15 percent of all queries concern readers' inability to make a particular piece of hardware or combination of hardware function satisfactorily. For example, about 10 percent of all ZX-81 questions concern SAVEing and/or LOADing problems. A similar proportion of Spectrum owners complain that they cannot obtain stable colour television pictures.

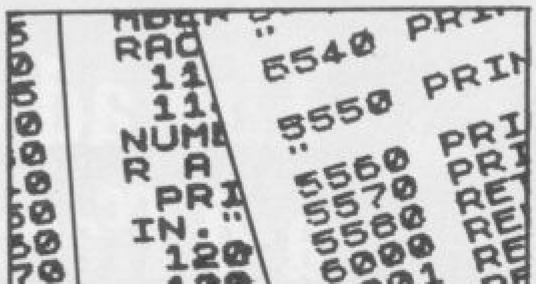
Since this issue will appear at a time when tens of thousands of new Sinclair users will have recovered from the excesses of Christmas and will be using their machines on winter evenings, I thought it would be appropriate to repeat some of the tips which have appeared previously.

The ZX-81 produces a black and white TV display. All television sets give a satisfactory picture although the Ferguson TVs sold by W H Smith, among others, give a particularly crisp and stable picture. There are three difficulties with the machine.

The first is that the keyboard is poor, so many owners purchase a second one. Of the number on the market I would hesitate to recommend one in particular. All the keyboards I have seen are reasonably satisfactory, although my impression is that the more expensive ones are likely to prove to be better purchases because the keys tend to be of better quality.

In some cases the ZX-81 is connected to the keyboard via the rear edge connector. In other cases the entire ZX-81 is installed inside the keyboard case. There is little to choose between these two approaches. In the former case making the connection is easy but the result is rather untidy. In the latter case users need a certain amount of confidence in their DIY ability, because it is necessary to dismantle the ZX-81 and thereafter the printed circuit board inside.

The second problem with the ZX-81 is that the 1K of memory in the basic machine is inadequate for all but the simplest tasks, so most owners buy ex-



tra memory which, except for those units designed to fit inside the second type of keyboard described, is plugged into the edge connector at the back of the computer. Unfortunately, the connection can be rather tenuous; jarring the machine can be enough to disturb it momentarily. That is sufficient to wipe the memory clean of its current program, so that the poor frustrated user is tempted to "jar" the computer a few more times — and rather harder, too.

Some of the add-on memories on the market are supplied with double-sided sticky pads to counteract this RAM wobble problem and at least one manufacturer supplies a special plastic support. Most users employ strategically-placed pieces of sticky tape.

The ZX-81 does not recognise immediately more than 16K of RAM and so most users buy that much additional memory. Colin Jones of West Bromwich, however, has a 64K RAM and he has stumbled on a problem. He writes:

I am puzzled. My machine keeps crashing due to what appears to be lack of memory when I add just one more line to my Basic program, which at present occupies only 15451 bytes, there being a further 27477 bytes free.

The source of his problem is the ZX-81 display file. An obscure feature of the design of the ZX-81 causes the machine to crash if a TV picture is shown while the display file straddles addresses 32767 and 32768. In fairness to Sinclair Research, it does not happen if the ZX-81 is used as designed with only 16K of RAM.

In the ZX-81 a Basic program starts at address 16509. The display file lies immediately above the Basic area and occupies 793 bytes. A quick calculation shows that Jones' display file currently ends at 32652, just 16 bytes short of the illegal boundary.

The solution to the problem is to put the ZX-81 into FAST mode and enter into the program a long line with at least 100 separate numbers in it. For example 10 LET A = 0 + 0 + ... + 0.

Such a line is rather tedious to enter but it is well worth the effort in the circumstances. While the line is being typed-in it is stored in the editing area which lies above the display file in memory.

On completion, i.e., when the newline key is pressed — the screen goes blank because the machine is in FAST mode and the line is transferred to the appropriate place in the program area. Numbers when stored in the program area are followed by six "hidden" bytes which are used to store the floating point form of the number. Thus each " 0 + " occupies eight bytes in the program area — one each for the " 0 " one for each " + " — and six hidden bytes; so the total line occupies rather more than 800 bytes. The display file is moved up in memory by that amount to accommodate the increased space requirement in the program area so that it lies completely above address 32767 when the display resumes.

The user can then continue to add program lines as usual. When a sufficient number have been added the mon-



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

ster line can be deleted, having served its purpose.

Incidentally, a machine code routine located above address 32767 in the ZX-81 will not function correctly, as Brian Gentle of Milton Keynes has discovered. The best location for machine code for those with 64K RAMs is between addresses 8192 and 16383. Code placed there will not be over-written and will remain in place when a new Basic program is loaded from tape. Provided the code is fully re-locatable it can occupy any address in that area.

The third problem is that many users have difficulty SAVEing and LOADing programs to and from cassettes. John Martin of Saffron Walden is the latest in a long line of readers who have written on the topic. He has analysed the waveform recorded on a number of commercial tapes for the ZX-81 and has noted substantial differences in their appearance. Nonetheless, each LOADs satisfactorily most of the time. He has much more difficulty with cassettes which he has recorded than with pre-recorded software.

Martin's story is not unusual. The fundamental problem appears to be that the ZX-81 is rather deaf. Some cheap cassette players are incapable of providing the relatively high signal levels necessary to LOAD a program successfully without introducing too much distortion.

Unfortunately, more expensive stereo cassette players which deliver higher signal levels do not solve the problem, because they contain sophisticated circuits designed to improve the quality of audio recordings but which introduce more distortion into recordings of computer data. There is also the danger that the very high signal levels produced by some expensive cassette players could damage the computer. My advice to the beginner having difficulties of this nature to ensure that the ZX-81 will LOAD programs satisfactorily is by taking it to a friend or neighbour who has a tried-and-tested combination and attempting to LOAD a pre-recorded cassette from his player into your computer.

So, clean the playing head of the cassette player carefully and connect one wire only from cassette player to computer — i.e., EAR socket to EAR socket. If repeated attempts to LOAD several cassettes all fail, return your computer to the shop from which you bought it and exchange it for another.

You may find that the program appears to LOAD but the LISTing on the screen is garbled and the program fails to function correctly. In that case you can be reasonably sure that if you persist in your attempts, perhaps varying the volume setting slightly, you will succeed eventually.

Having established that your machine works with your friend's player the next step is to try your own. Put the tone control, if present, to the highest treble setting and turn the volume control to maximum. Play a few seconds of a pre-recorded tape without a plug in the EAR socket so that the loudspeaker is activated. If the "very harsh high-pitched buzz" described on page 108 of the ZX-81 manual is loud enough to send the cat diving for cover and wake the baby next door, it is probably sufficient for the ZX-81 to LOAD the program.

When your ears have stopped ringing, re-wind the cassette and try LOADing it into your ZX-81. Observe the pattern on the TV display. When the program is LOADing, the display should consist of broad but unstable horizontal black-and-white bands.

If the signal level is too low, the white bands will be broader than the black. If it is too high, the black bands will be broader than the white, to the point where almost the entire screen is black. Adjust the volume setting until neither black nor white dominates, rewind the cassette and try again. You should find that the tape LOADs, perhaps after two or three attempts.

Finally, SAVE a short program from your ZX-81 on to a fresh blank cassette. Ensure that only a single wire connects the two MIC sockets and keep it well away from your TV set. If you cannot record a very harsh high-pitched buzz which is more or less as loud as the program on a pre-recorded cassette, return to your friend and use his equipment to determine whether it is your ZX-81 or your cassette player which is at fault.

Assuming that you can SAVE programs satisfactorily, you may well find that they are less easy to LOAD than pre-recorded material. That is because your cassette player does not record with the same fidelity as the equipment used to produce commercial programs. There is nothing much you can do about it except to make multiple copies of all programs, so that if one copy fails you have at least one more copy. There are a number of rules to observe when using cassettes for storing programs:

- Keep them free of dust by storing them in their library cases. A drop-out which would be barely noticeable in an audio cassette will stop a program from reLOADing.
- Keep them away from the television set. The strong magnetic field present will degrade the recording.
- "Exercise" them occasionally, i.e., fast-wind them from one end to the other and back again. That will minimise "print through" from one layer of tape to the next and even taut and slack areas.
- Keep back-up copies.

> "About 15 percent of all queries concern readers' inability to make a particular piece of hardware function satisfactorily"

SAVEing and LOADing programs is much less of a problem with the Spectrum. A number of readers complain, however, that they cannot obtain satisfactory colour TV pictures; either the colour shimmers too much for comfort or it cannot be obtained at all. It is very difficult to recommend a particular make of TV as requested by John Anton of Ashford. I used to feel that the Ferguson TX range worked well but my company recently bought one of the new models in the range and it is not as satisfactory as previous purchases.

My advice is to try before you buy if at all possible. Most TV retailers will allow potential purchasers to test the TV of their choice with their home computers, provided the shop is not too busy with other customers.

Continued on page 128

Continued from page 127

A number of readers are uneasy about the difference in practice between the 16K and 48K Spectrum. Derek Burn of Chalfont St Giles writes: **Can all 16K Spectrum programs be run unchanged on the 48K machine? I am prompted to ask by seeing 16K program listings which have an addendum giving modifications for the 48K computer.**

The strict answer to the question is no. There are small differences in the use of RAM between the two machines and so minor variations are needed in some programs to take account of those differences. The principal difference is that both the ZX-81 and the Spectrum use memory from the bottom upwards and the top downwards, with all spare memory concentrated in between.

> "My advice is to try before you buy if at all possible"

Clearly if 32K of memory is added at the top of the machine, the material which was previously at the top of RAM must be moved up by 32K to amalgamate the extra memory into the spare area. Certain system variables, RAMTOP in particular, enable the machine to keep track of those alterations.

In practice, the difference between 16K and 48K programs is usually very small and can be accommodated by an addendum to the program listing. You will find that all pre-recorded 16K programs on the market will also run on 48K machines, although the converse, of course, is not true.

Unfortunately there can be difficulty with some commercial cassettes when programs are LOADed into a Series III machine. Norman Godsmark of Witham asks in some annoyance: **How much software is being sold to unsuspecting owners of Series III Spectrums which will not operate with their computers?**

The answer, fortunately, is not very much. The problem has arisen because Sinclair recently released a slightly-modified version of the new machine, the Series III, which responds differently to the IN command compared to the previous two models. To test your machine enter

PRINT IN 16602

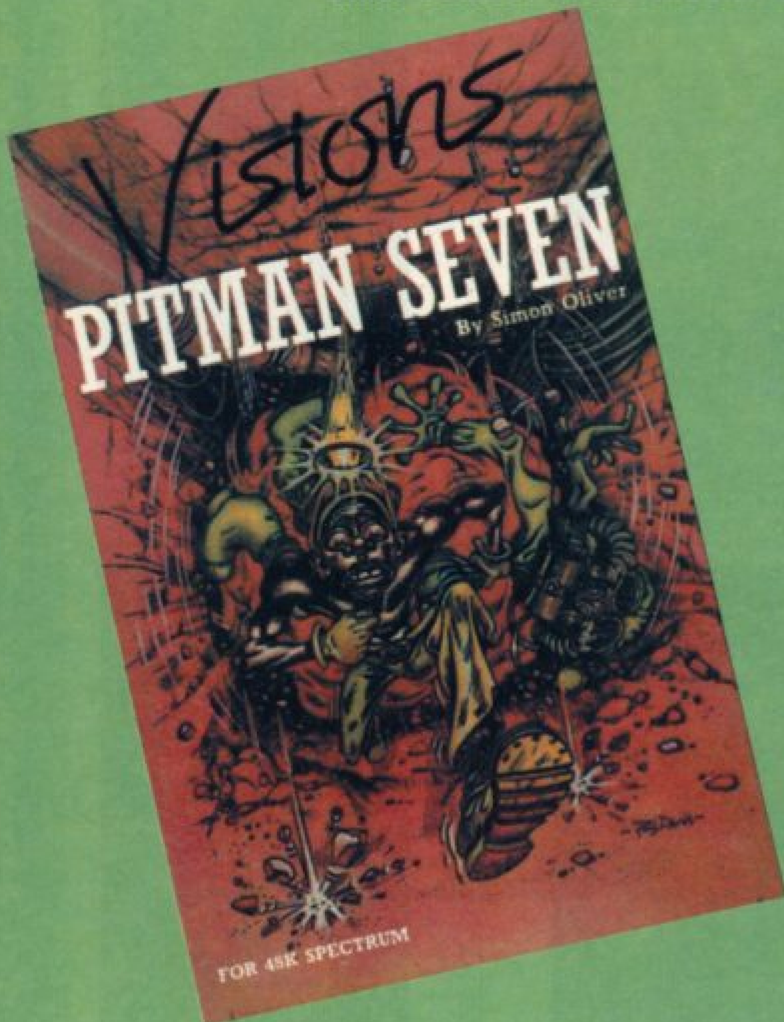
A Series I or Series II machine will respond with 63, whereas a Series III will respond with 191. The IN command, or its machine code equivalent, is used in a number of commercial programs to read the keyboard; that is the source of the problem. If the program is in machine code and the creator was cautious when he wrote it, the program will interpret automatically the input on both types of machine correctly and so the difficulty is not as widespread as it might have been.

If you encounter a problem of this nature, contact the software house which publishes the program and ask for a replacement copy.



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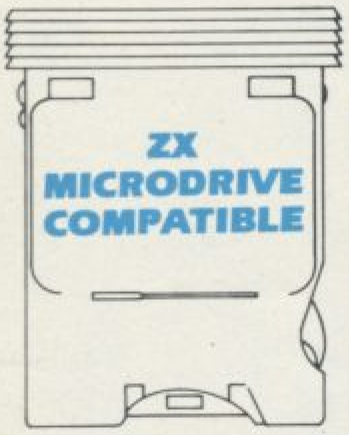
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Quentin Heath's latest round-up

New paths explored in Norse adventure

THERE IS a change in direction for adventure games. The path taken so far by authors has been through text-only displays, which left a great deal to the imagination, through graphics adventures which looked like board games and then on to animated games.

The progression was by necessity rather than design. The first adventures were produced on large mainframe computers. The original **Adventure,** written by Crowther and Woods, occupied most of the memory capacity of one of those giant machines and included more than 200 locations. A micro version of the game is available from CP Software, Syrtis Software and Abersoft.

The reason it was text-only is that 10 years ago computers communicated mostly using teletypewriters or line printers. There was no room for graphics on those relatively primitive machines.

The arrival of the microcomputer and its reliance on fairly inexpensive television sets or visual display units gave adventure authors the opportunity for which they had been waiting. Few people, however, accepted the challenge of adding graphics to adventures.

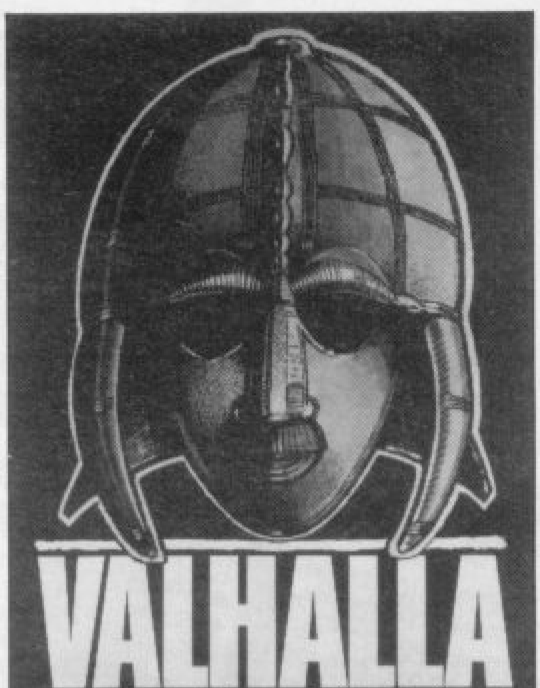
There was a gap of at least two years before authors began to use the full potential of the machines. Until then users of micros had to tolerate text-only creations, such as the Artic adventures for the ZX-81 and the Spectrum.

The next step was into software which generated still pictures of some of the locations which could be visited during the game. That type included **The Hobbit** from Melbourne House, the **Mysterious Adventures** from Digital Fantasia and the illustrated games, such as **Magic Mountain** and **Greedy Gulch** from Phipps Associates.

A progression of the technique followed a few months later with the launch of the Carnell Software **Black Crystal** for the ZX-81 and Spectrum. It is like a board game as it uses several maps of the terrain on which the player moves. In the proper circumstances the player can move into a castle on one of the maps and on to another map showing the castle interior.

Not content with that limited form of moving graphics adventure, some companies decided to go a step further and produce something which was a cross between the **Hungry Horace** cartoons and the original adventure game concept. The two companies to the fore of this move are Legend and Doric Computer Services.

Doric has produced **Oracle's Cave,** the Spectrum version of a ZX-81 game which bears some resemblance to the Wumpus-hunt type of adventures which were, at one time, all the rage in the ZX-81 market. It involves your player-character who has decided to explore a cave system in which an evil oracle stands guard over some treasure.



The exceptional aspects of the game include a set time limit of five game-days and the sprite animated graphics which depict your character and the monsters. As you move through the cave system the scenery scrolls up, down or sideways, depending on where you are going.

Valhalla from Legend, which is proving as popular as **The Hobbit** for many people, also uses animation. It is, however, closer to the original adventure goal of completing certain logical tests or solving some puzzles. Unlike Oracle's Cave, Valhalla also allows you to use English sentence structures to give commands to the characters.

Every scene in the adventure is shown graphically and when you ask a character to perform an action that character will move on the screen.

In many respects the game is more technically-advanced than The Hobbit, although much of the code is written in Basic. The graphics are drawn more quickly than those of The Hobbit and the characters taking part seem to have more independence.

Through a kind of time-sharing system between the gamer and the program it is possible for a player to be entering a command and for the computer to be moving one of the characters across the screen.

The author has used a novel command entry system. If part of the command is not in the command recognition database, or is unintelligible, the computer will mark it in red and not accept the command. It may, however, allow it to be entered and then make no reply to the player or forget about the last command.

The plot of Valhalla, in essence, is like that of Oracle's Cave. There are several quests you have to complete before you can go to the Norse warrior's Hell and live out the rest of your death.

You have to get a series of sacred objects, including a key, a helmet and an axe which will give you certain powers. To do so you have the help and the hindrance of the characters of Norse mythology including Thor, Odin and Loki. During the quest you have to eat and drink to stay alive.

The authors have not been content just to make your characters pick up food or drink on the screen. You can watch them put the bottle or meat to their mouths, mimicking the act of drinking or eating.

Next month I will be looking at **Circus,** an adventure from Digital Fantasia, and launching into the first part of the Penguin Korth Trilogy, **Escape From Arkaron.**

HINTS AND TIPS

It is unwise to travel ring roads when you are a novice. You could get lost.

It may seem as if there are two sides to every coin. Only one side will help you win and evil is in its way.

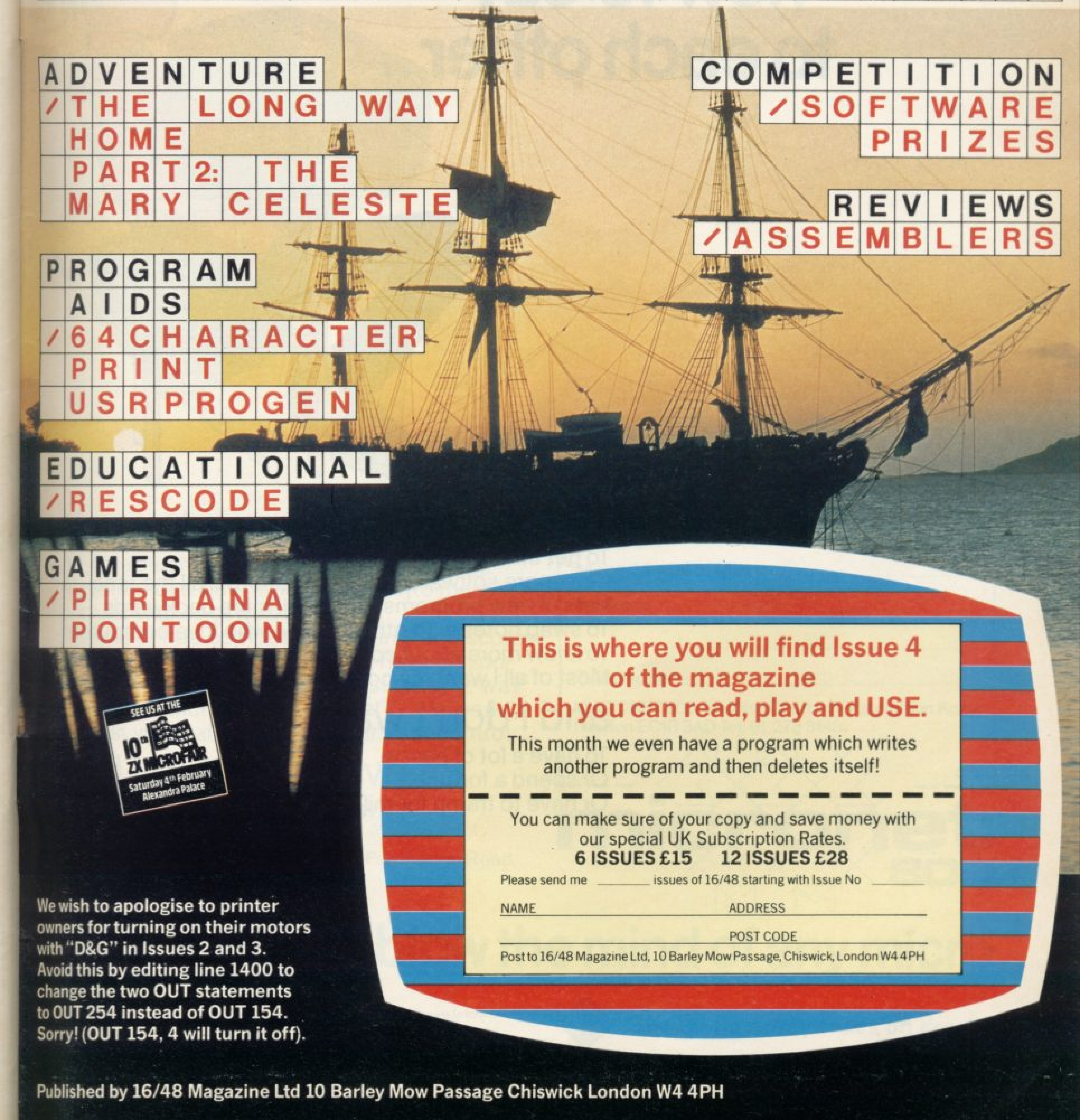
To gain the first objective you will need to gain a friendship.


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16/48

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We wish to apologise to printer owners for turning on their motors with "D&G" in Issues 2 and 3. Avoid this by editing line 1400 to change the two OUT statements to OUT 254 instead of OUT 154. Sorry! (OUT 154, 4 will turn it off).

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SOFTWARE DIRECTORY

If we have reviewed a cassette we have given it a rating known as the Gilbert Factor. That factor includes value for money, the screen layout, the conciseness and speed of the program, the accomplishment of the task it aims to achieve, and the use it makes of the machine.

Name	Machine	Company	Type	Gilbert factor
ABC Liftoff	48K Spec.	Longman	Education	*
Abyss	48K Spec.	CCS	Adventure	*
Ace in the Hole	48K Spec.	Add-on	Adven.	*
Accounts (Sole Trader)	48K Spec.	Hestacrest	Business	*
Accounts (Limited Company)	48K Spec.	Hestacrest	Business	*
Accounts (Sole Trader)	16K ZX-81	Hestacrest	Business	*
Accounts (Limited company)	16K ZX-81	Hestacrest	Business	*
Address Manager	48K Spec.	OCP	Business	7
Adventure 1	48K Spec.	Abersoft	Adven.	6
Adventure 1	16K ZX-81	Abersoft	Adven.	6
Adventure Isl.	48K Spec.	Contrast	Adven.	*
Airline	16K ZX-81	CCS	Sim.	7
Airline	48K Spec.	CCS	Sim.	7
Airliner	16K Spec.	Protek	Sim.	6
Air Traffic Controller	16K Spec.	Hewson	Sim.	6
Alien Dropout	16K ZX-81	Silversoft	Arcade	*
Allsort S-1	48K Spec.	A Firminger	Utility	7
Alphabet	16K Spec.	Widget	Education	*
Android One	16K Spec.	Vortex	Adven.	*
Ant Attack	48K Spec.	QS	Arcade	8
Apocalypse	48K Spec.	Red Shift	Mind Game	*
Aquarius	16K Spec.	Bug-Byte	Arcade	6
Arcadia	16K Spec.	Imagine	Arcade	5
Arcadian	16K Spec.	J K Greye	Arcade	6
Arcane Quest	48K Spec.	Add-on	Adven.	*
Armageddon	48K Spec.	Silversoft	Arcade	*
Aspect	16K Spec.	Bug Byte	Utility	5
Assassin	16K Spec.	Spectrasoft	Arcade	*
Assembler	48K Spec.	Artic	Utility	6
Asteroids	16K ZX-81	Silversoft	Arcade	8
Asteroids	16K ZX-81	Software Farm	Arcade	6
Astral Convoy	16K ZX-81	Vortex	Arcade	*
Astrology	16K Spec.	Stellar Servs.	Utility	7
Astrology	16K ZX-81	Stellar Servs.	Utility	7
Attack on New York	16K Spec.	Fry	Arcade	*
Audio Sonics	16K Spec.	Work Force	Utility	4
Auto Chef	16K Spec.	CCS	Sim.	*
Auto Chef	16K ZX-81	CCS	Sim.	*
Avenger	16K Spec.	Abacus	Arcade	*
Backgammon	48K Spec.	CP	Mind Game	7
Backgammon	16K Spec.	Hewson	Mind Game	*
Ballooning	16K Spec.	Heinemann	Educational	*
Baltic Patrol	16K Spec.	E. Midland	Arcade	*
Bank Account Syst.	48K Spec.	K Gouldstone	Business	8
Bank Raid	16K ZX-81	J M Senior	Game	*
Barrow Quest	16K ZX-81	Sherry	Adven.	*
Base Invaders	48K Spec.	Work Force	Arcade	6
Battle of Britain	48K Spec.	Microgame	Strat.	*
Battleships	16K ZX-81	JRS	Strat.	*
Beamscan	48K Spec.	Beamscan	Utility	9
Beta Basic	16K Spec.	Betasoft	language	9
Beyond Basic	48K Spec.	Sinclair	Utility	*
Big Match Soccer	16K Spec.	Winters	Strat.	*
Biorythms/Pyramids of Egypt	16K Spec.	Spectrasoft	Game	*
Black Crystal	48K Spec.	Carnell	Adven.	7
Black Crystal	16K ZX-81	Carnell	Adven.	7
Black Dwarf's Lair	48K Spec.	Newsoft	Adven.	*
Black Hole	16K Spec.	Quest	Arcade	6
Black Planet	48K Spec.	Phipps	Adven.	7
Blind Alley	16K Spec.	Sunshine	Arcade	7
Brain Damage	48K Spec.	Silversoft	Arcade	*
Breakaway	16K Spec.	Procom	Arcade	*

Name	Machine	Company	Type	Gilbert factor
Brewery	48K Spec.	CCS	Strat.	8
Bridge Master	16K Spec.	Bridgemaster	Trad. Mind Game	8
Bridge Tutor	16K Spec.	CP	Mind Game	*
British Lowland	48K Spec.	CCS	Sim.	*
Bugaboo	48K Spec.	QS	Arcade	7
Bug Blaster	16K Spec.	Crystal Comp.	Arcade	*
Business Bank Account	48K Spec.	Transform	Business	*
Business Bank Account	16K ZX-81	Transform	Business	*
Byte	48K Spec.	CCS	Adven.	*
Byter	16K ZX-81	Protek	Arcade	*
Calpac 1	16K Spec.	Calpac	Education	*
Calpac 2	16K Spec.	Calpac	Education	*
Calpac 3	16K Spec.	Calpac	Education	*
Calpac 1	16K ZX-81	Calpac	Education	*
Calpac 2	16K ZX-81	Calpac	Education	*
Caribbean Trader	48K Spec.	E. Midland	Adven.	*
Car Journey	16K Spec.	Heinemann	Educational	*
Cassette 1	1K ZX-81	Orwin	Arcade	*
Cassette 2	16K ZX-81	Orwin	Arcade	*
Cassette 3	16K ZX-81	Orwin	Arcade	*
Cassette 4	16K ZX-81	Orwin	Arcade	*
Cassette 5	16K ZX-81	Orwin	Arcade	*
Cassette A	16K Spec.	Orwin	Arcade	*
Castle Colditz	48K Spec.	Felix	Adven.	*
Castle Colditz	16K ZX-81	Felix	Adven.	*
Caterpillar	16K Spec.	CDS	Arcade	*
Cavernfighter	16K Spec.	Bug-Byte	Arcade	*
Character Gen	16K Spec.	Spectrasoft	Utility	*
Chess Tutor 1	48K Spec.	Sinclair	Educational	*
Chequered Flag	48K Spec.	Sinclair	Arcade	8
Children's Compendium	16K Spec.	Dymond	Game	*
Chuckie Egg	16K Spec.	A and F	Arcade	*
Chuckman	48K Spec.	Add-on	Arcade	*
City Defence	16K Spec.	Mikro-Gen	Arcade	*
Collector's Pack	48K Spec.	Sinclair	Business	7
Colossal Caves	48K Spec.	CP	Adven.	8
Compiler	48K Spec.	Softek	Utility	6
Composer	48K Spec.	Contrast	Utility	*
Conflict	48K Spec.	Martech	Strat.	*
Conflict	16K ZX-81	Martech	Strat.	7
Countabout	48K Spec.	Longman	Education	*
Countries of the World	16K Spec.	Hewson	Utility	8
Corridors/Genon	48K Spec.	New Gen.	Arcade	9
Cosmic Guerilla	16K Spec.	Crystal Comp	Arcade	8
Counting	16K Spec.	Starter Soft	Education	*
Counting	16K Spec.	Widget	Education	*
Creepy Crawler	16K Spec.	Mikro-Gen	Arcade	*
Crevasse and Hotfoot	16K Spec.	Microsphere	Games	7
Critical Path Analysis	48K Spec.	Hilderbay	Business	*
Critical Path Analysis	16K ZX-81	Hilderbay	Business	6
Cruising	16K Spec.	Sunshine	Arcade	4
Cry Wolf!	48K Spec.	Add-on	Adven.	*
Cyber Rats	16K Spec.	Silversoft	Arcade	7
Cycle Planner	16K Spec.	Medidata	Utility	4
Cyber Zone	48K Spec.	Crystal Comp.	Arcade	*
Dallas	16K Spec.	CCS	Sim.	6
Dallas	16K ZX-81	CCS	Sim.	6
Database	48K Spec.	Microl	Business	7
Demolition	16K ZX-81	Comp. Rntls.	Game	*
Derby Day	48K Spec.	Comp. Rntls.	Game	*
Destroyer	16K Spec.	Winters	Game	*
Devils of Deep	48K Spec.	Shephard	Adven.	*

Name	Machine	Company	Type	Gilbert factor
Dictator	16K Spec.	Bug Byte	Strat.	*
Dietron	16K Spec.	Custom	Utility	6
Dimension Destructors	48K Spec.	Artic	Arcade	8
Disassembler	16K Spec.	dK' Tronics	Utility	7
Display	16K Spec.	Work Force	Utility	*
DIY Book-keeping	48K Spec.	RAMTOP	Business	*
DLAN	48K Spec.	Campbell	Utility	*
Dodge City	48K Spec.	Phoenix	Arcade/adven.	*
Do Not Pass Go	48K Spec.	Work Force	Strat.	6
Do Not Pass Go	16K ZX-81	Work Force	Strat.	*
Door Slammer	16K ZX-81	Cathedral	Arcade	7
Draft	16K ZX-81	Myrmidon	Business	*
Draughts	48K Spec.	CP	Mind Game	7
Dungeons of Doom	16K ZX-81	Woosoft	Adven.	*
Dungeon Master	48K Spec.	Crystal Comp.	Adven.	8
Dymonoids	16K Spec.	Dymond	Game	*
Editor Assembler	16K Spec.	Picturesque	Utility	8
Educational	16K Spec.	Startersoft	Education	*
Education One	16K Spec.	Lerm	Education	*
Elektro Storm	48K Spec.	PSS	Arcade	*
Engine Diagnostic	48K Spec.	Spectrasoft	Utility	*
Escape	16K Spec.	New Generation	Maze	8
Espionage Isl.	48K Spec.	Artic	Adven.	5
Espionage Isl.	16K ZX-81	Artic	Adven.	*
Exit	48K Spec.	Abbex	Arcade	6
Everest Ascent	48K Spec.	Shepard	Adven.	6
Evolution	48K Spec.	Microsphere	Game	*
Family Games Pack	16K Spec.	Hornby	Game	*
Farmer	16K Spec.	CCS	Sim.	*
Farmer	16K ZX-81	CCS	Sim.	*
Fighter Pilot	16K ZX-81	Digital Int.	Sim.	5
Finance Manager	16K Spec.	OCP	Business	9
Firework Music	16K Spec.	Soft Cottage	Education	8
Flight Sim.	48K Spec.	Sinclair	Sim.	6
Flight Sim.	16K ZX-81	Sinclair	Sim.	6
Flippit	16K Spec.	Sinclair	Puzzle	7
Football	16K Spec.	Winters	Sim.	*
Football Manager	48K Spec.	Addictive Gms.	Sim.	7
Football Manager	16K ZX-81	Addictive Gms.	Sim.	*
The Forest	48K Spec.	Phipps	Simulation	*
Football Pools Program	16K ZX-81	Hartland	Utility	*
Football Pools Program	48K Spec.	Hartland	Utility	*
Forth	48K Spec.	Abersoft	Language	9
Forth	48K Spec.	Sinclair	Language	7
Forth	16K ZX-81	Sinclair	Language	7
Four Rules of Number	16K Spec.	Micro Master	Education	*
Four Rules of Number	16K ZX-81	Micro Master	Education	*
FP Compiler	16/48 Spec.	Softek	Utility	9
French Mistress	48K Spec.	Kosmos	Educ.	*
French Voc Test	16K Spec.	Tutorial	Education	*
French Voc Test	48K Spec.	Tutorial	Education	*
Froggy	16K ZX-81	DJL	Arcade	7
Froggy	16K Spec.	DJL	Arcade	7
Fruit Line	16K Spec.	P A Hanson	Game	*
Fruit Machine	16K Spec.	dK' Tronics	Game	6
Full-screen Breakout	1K ZX-81	New Generation	Arcade	*
Galaxians	16K Spec.	Artic	Arcade	6
Galaxy Conflict	48K Spec.	Martech	Strat.	*
Galaxy Conflict	16K Zx-81	Martech	Strat.	8
Gambling Tape	16K Spec.	Dymond	Game	*
Games	16K ZX-81	P Teakle	Game	*
Games 2	16K ZX-81	JRS	Game	*
Games Tape 1	1K ZX-81	J K Greye	Game	*
Games Tape 2	16K ZX-81	J K Greye	Game	*
Games Tape 3	16K ZX-81	J K Greye	Game	*
Games Pack 1	16K Spec.	A Burnham	Game	*
Games Tape 1	16K Spec.	Sospan	Game	*
Games Tape 2	16K Spec.	Sospan	Game	*
Gangsters	48K Spec.	CCS	Strat.	8
General Election	48K Spec.	Bug-Byte	Simulation	*
Ghost Hunt	16K Spec.	PSS	Arcade	*
Gnasher	16K Spec.	R & R	Maze	8
Gobble-a-Ghost	16K Spec.	CDS	Arcade	*
Gobbleman	16K Spec.	Artic	Arcade	*
Gobbleman	16K Zx-81	Artic	Arcade	*
Gobbler	16K ZX-81	Software Farm	Arcade	*
Golden Apple	48K Spec.	Artic	Adven.	7
Golf	16K Spec.	R & R	Sim.	7
Golf	16K Spec.	Virgin	Sim.	8
Gorgon	48K Spec.	Phipps	Adven.	*
Gorilla	16K Spec.	D Hornsby	Game	*
Go To Jail	48K Spec.	Automata	Trad.	*
Grand Prix	16K ZX-81	dK' Tronics	Arcade	*
Graphics	16K ZX-81	IPA	Utility	*
Graphics Toolkit	16K ZX-81	JRS	Utility	9
Great Britain Ltd	48K Spec.	Hessel	Strat.	7
Great Britain Ltd	16K ZX-81	Hessel	Strat.	*
Greedy Gulch	16K ZX-81	Phipps	Adven.	7
Ground Attack	16K Spec.	Silversoft	Arcade	6
Ground Force Zero	16K Spec.	Titan	Arcade	*
Guitar Tutor 1	48K Spec.	Harlequin	Education	*
Guitar Tutor 2	48K Spec.	Harlequin	Education	*
Gulp 2	16K ZX-81	Campbell	Arcade	*
Gulpman	16K Spec.	Campbell	Arcade	*
Halls of Things	48K Spec.	Crystal Comp.	Adven.	9
Handwriting	48K Spec.	Chalksoft	Educ.	*
Hanoi King	48K Spec.	Contrast	Mind Game	*
Haunted Hedges	16K Spec.	Micromega	Arcade	6
Heathrow	16K Spec.	Hewson	Sim.	8
Hidden Letters	16K Spec.	Poppy	Education	*
High Noon	48K Spec.	Work Force	Arcade	9
High-resolution Invaders	16K ZX-81	Odyssey	Arcade	*
Hitch Hikers' Guide to the Galaxy	48K Spec.	ESP	Adven.	6
Hobbit	48K Spec.	Sin/M.Hse.	Adven.	9
Hole	48K Spec.	Add-on	Adven.	*
Horace and the Spiders	16K Spec.	Sinclair	Arcade	8
Horace Goes Skiing	16K Spec.	Sinclair	Arcade	8
Hopper	16K Spec./ Spec.	PSS	Arcade	*
Horror Atoll	48K Spec.	Add-on	Adven.	*
Hot Dot Spotter	16K Spec.	Longman	Education	*
Hungry Horace	16K Spec.	Sinclair	Arcade	8
Hunter Killer	48K Spec.	Protek	Arc. Adv.	*
I Ching	48K Spec.	Sirius	Game	*
Inca Curse	48K Spec.	Sinclair	Adven.	6
Inca Curse	16K ZX-81	Sinclair	Adven.	*
Inkos	48K Spec.	Chalksoft	Sim.	*
Integration	16K Spec.	University	Utility	8
Integration	16K ZX-81	University	Utility	8
Intermediate English 1	16K Spec.	Rose	Education	*
Intermediate English 1	16K ZX-81	Rose	Education	*
Intermediate English 2	16K Spec.	Rose	Education	*
Intermediate English 2	16K ZX-81	Rose	Education	*
Intermediate Maths 1	16K Spec.	Rose	Education	*
Intermediate Maths 1	16K ZX-81	Rose	Education	*
Intermediate Maths 2	16K Spec.	Rose	Education	*
Intermediate Maths 2	16K ZX-81	Rose	Education	*
Invaders	16K ZX-81	Abersoft	Arcade	*
Invaders	16K ZX-81	Bug Byte	Arcade	*
Invaders	16K ZX-81	Silversoft	Arcade	*
Invasion Force	16K Spec.	Artic	Arcade	8
Invincible Isl.	48K Spec.	Shephard	Adven.	8
Jackpot	48K Spec.	Comp. Rntls.	Arcade	*
Jogger	16K Spec.	Severn	Arcade	*
Johnny Reb	48K Spec.	Lothlorian	Sim.	*

Name	Machine	Company	Type	Gilbert factor
Keysounder	16K Spec.	S and G	Utility	*
The Key	16K Spec.	Keysoft	Utility	*
King Arthur	48K Spec.	E. Midland	Simulation	*
Knight's Quest	48K Spec.	Phipps	Adven.	6
Knight's Quest	16K ZX-81	Phipps	Adven.	*
Krazy Kong	16K ZX-81 / 48K Spec.	PSS	Arcade	*
Labyrinth	16K Spec.	Axis	Arcade	4
Language Devel. Series	16K Spec.	Glasson	Education	*
Language Devel. Series	16K ZX-81	Glasson	Education	*
Language Devel. Series	16K ZX-81	Micro Master	Education	*
Language Devel. Series	16K Spec.	Micro Master	Education	*
Lazatron	48K Spec.	Contrast	Arcade	*
Leap Frog	16K Spec.	CDS	Arcade	*
Learning Read 1	16K Spec.	Poppy	Education	*
Leopard Lord	48K Spec.	Add-on	Adven.	4
Light Cycle	16K Spec.	PSS	Arcade	*
Linear Progging	16K Spec.	University	Utility	*
Linear Progging	16K ZX-81	University	Utility	*
Lost Island	16K ZX-81	JRS	Adven.	*
Lost Over Bermuda	48K Spec.	Add-on	Adven.	*
Luna Crabs	16K Spec.	Micromega	Arcade	7
Machine Code Test Tool	16K Spec.	OCP	Utility	7
Machine Code Test Tool	16K ZX-81	OCP	Utility	*
Mad Martha	48K Spec.	Miko-Gen	Adven.	7
Magic Mountain	16K ZX-81	Phipps	Adven.	*
Mailing List	16K ZX-81	Hestacrest	Business	*
Make-a-Chip	48K Spec.	Sinclair	Educational	*
Manic Miner	48K Spec.	Bug-Byte	Arcade	9
Marks Book	16K Spec.	Lerm	Utility	*
Masterfile	48K Spec.	Campbell	Business	8
Masterfile 16	16K Spec.	Campbell	Business	*
Matcalc	16K Spec.	Work Force	Utility	*
Maths Tutor	16K Spec.	AD Software	Education	*
Matrix Operations	16K ZX-81	University	Utility	7
Matrix Operations	16K Spec.	University	Utility	7
Maze Chase	16K Spec.	Hewson	Arcade	8
Maze Death Race	48K Spec.	PSS	Arcade	*
Maze Death Race	16K ZX-81	PSS	Arcade	*
Maze Man	16K ZX-81	Abersoft	Arcade	*
Maziacs	48K Spec.	dK' Tronics	Arcade	8
Mazogs	16K ZX-81	Bug Byte	Arcade	*
MCoder	16K Spec.	PSS	Utility	8
MCoder	16K ZX-81	PSS	Utility	8
Melbourne Draw	48K Spec.	Melbourne Hse.	Utility	7
Merchant of Venus	16K ZX-81	Crystal	Adven.	7
Meteoroids	16K Spec.	dK' Tronics	Arcade	7
Meteoroids	16K Spec.	Softek	Arcade	6
Meteor Storm	16K Spec.	Quicksilva	Arcade	7
Micropen	16K Spec.	Contrast	Utility	*
Mined Out	16K Spec.	Quicksilva	Arcade	7
Mines of Saturn/ Return to Earth	16K Spec.	Mikro-Gen	Adven.	*
Money	16K Spec.	Poppy	Education	*
Monitor/Diss.	48K Spec.	Sinclair	Utility	8
Moria	16K Spec.	Severn	Adven.	*
Muncher	16K Spec.	Silversoft	Arcade	*
Muncher	16K Spec.	Silversoft	Arcade	6
Music Master	48K Spec.	Sinclair	Educational	*
Namtir Raiders	16K ZX-81	Artic	Arcade	8
Nanas	16K Spec.	Mikro-Gen	Arcade	*
Night Gunner	16K ZX-81	Digital	Sim.	5
NightFlite	16K Spec.	Hewson	Sim.	5
Night Sky	16K Spec.	Bridge	Utility	*
Nowotnik Puzzle	16K Spec.	Phipps	Game	7
Nowotnik Puzzle	16K ZX-81	Phipps	Game	*
Number 6	16K Spec.	Prime	Education	*
Odds-on	16K Spec.	RSD	Game	*
O Level Chemistry	48K Spec.	Calpac	Education	*
O Level Chemistry	16K ZX-81	Calpac	Education	*
O Level Fench Revision	16K ZX-81	Rose	Education	*
O Level Maths Revision	16K ZX-81	Rose	Education	*
O Level Physics	16K Spec.	Homestudy	Education	*
O Level Physics	48K Spec.	Think Tank	Education	*
Omnicalc	48K Spec.	Microsphere	Business	9
Orbiter	16K Spec.	Silversoft	Arcade	7
Original Superchess	48K Spec.	CP Software	Tradtitional	*
Original Superchess	16K ZX-81	CP Software	Traditional	*
Ostron	16K Spec.	Softek	Arcade	*
Othello	16K Spec.	CP Software	Traditional	*
Othello	16K Spec.	M.O.I.	Traditional	*
Othello	16K ZX-81	M.O.I.	Traditional	*
Party Time	48K Spec.	C. Tutor	Educ.	*
Pascal Compiler	48K Spec.	Hi-Soft	Language	*
Pathfinder	16K Spec.	Widget	Education	*
Payroll	48K Spec.	Hilderbay	Business	9
Payroll	16K ZX-81	Hilderbay	Business	*
Payroll	32K ZX-81	Soft Tech	Business	*
Payroll	48K ZX-81	Soft Tech	Business	*
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Penetrator	48K Spec.	Mel. Hse.	Arcade	7
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Personal Banking System	16K ZX-81	Hilton	Business	*
Personal Financ. Management Syst.	48K Spec.	Fulwood	Bus.	*
Pharoah's Tomb	16K ZX-81	Phipps	Adven.	*
Pilot	16K ZX-81	Hewson	Simulation	7
Pimania	16K ZX-81	Automata	Simulation	*
Pimania	48K Spec.	Automata	Simulation	7
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Pirate	48K Spec.	Chalksoft	Educ.	*
Pitman Seven	16K Spec.	Visions	Adven.	*
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Polynomials	16K Spec.	University	Utility	8
Polynomials	16K ZX-81	University	Utility	
Pool	16K Spec.	Bug Byte	Game	7
Pat the Postman	48K Spec.	Mikro-Gen	Arcade	*
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Primary Arithmetic	16K ZX-81	Rose	Education	*
Print Shop	16K Spec.	CCS	Simulation	8
Print Shop	16K ZX-81	CCS	Simulation	*
Print Utilities	16K Spec.	Sinclair	Utility	*
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Programmer's Dream	16K Spec.	Work Force	Utility	8
Programme Enhancement Package	16K ZX-81	R and R	Utility	*
Puckman	16K ZX-81	Hewson	Arcade	*
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Roulette	48K Spec.	Dymond	Traditional	*
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Sales Ledger	16K ZX-81	Hestacrest	Business	*
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Secret Valley	16K ZX-81	Newsoft	Adven.	*
Security Shelter	48K Spec.	Add-on	Arcade	*

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Self-teach Program	16K Spec.	Anvil	Education	*
Self-teach Program	16K ZX-81	Anvil	Education	*
Sentinel	16K Spec.	Abacus	Arcade	7
Serpents Tomb	16K ZX-81	Vortex	Adven.	*
The Settler	16K Spec.	BSS	Utility	*
The Settler	16K ZX-81	BSS	Utility	*
Shape Sorter	16K Spec.	Widget	Education	*
Sideways Copy	16K ZX-81	D King	Utility	*
Sheepwalk	48K Spec.	Virgin	Game	7
Sheer Panic	16K Spec.	Visions	Arcade	7
Ship of Doom	48K Spec.	Artic	Adven.	7
Shiva Special 1	16K Spec.	Shiva	Games	*
Shopping List	16K Spec.	SD	Utility	*
Sky Raider	16K Spec.	C M Smith	Arcade	*
Slippery Sid	16K Spec.	Silversoft	Arcade	8
Slow Loader	16K Spec.	ELR	Utility	9
Snail Logo	48K Spec.	CP	Educ/Lang.	8
Snooker	16K Spec.	Visions	Arcade	*
Softalk 1	48K Spec.	CP	Utility	*
Softalk 2	48K Spec.	CP	Utility	8
Solaris	48K Spec.	Softel	Adven.	*
Solo Whist	16K Spec.	Video Soft.	Traditional	*
Sound FX	16K Spec.	dK' Tronics	Utility	6
Space Fighter	16K Spec.	Winters	Arcade	*
Space Intruders	16K Spec.	QS	Arcade	7
Space Lanes	16K Spec.	Cathedral	Arcade	*
Space Raiders	16K Spec.	Sinclair	Arcade	6
Space Raiders	16K ZX-81	Sinclair	Arcade	*
Space Trek	16K ZX-81	JRS	Arcade	*
Space Zombies	16K Spec.	Mikro-Gen	Arcade	*
Spanish Gold	48K Spec.	Chalksoft	Education	*
Speak and Spell	48K Spec.	S and G	Education	*
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Spec. Assembler	48K Spec.	Artic	Utility	*
Spec. Bug	16K Spec.	Artic	Utility	*
Spec. Tape Copier	16K Spec.	S Giza	Utility	*
Spectadraw 2	48K Spec.	McAlley	Utility	*
Spectipede	16K Spec.	R and R	Arcade	8
Spectral Panic	16K Spec.	Hewson	Arcade	5
Spec. Compiler	48k Spec.	Softek	Utility	7
Spec. Editor/ Assembler	16K Spec.	Picturesque	Utility	8
Spec. Forth	48K Spec.	Abersoft	Language	9
Spec. Forth	48K Spec.	CP	Utililty	8
Spec. Frogs/ Showdown	16K Spec.	Artic	Arcade	*
Spec. Gobbleman	16K Spec.		Arcade	*
Spec. Invaders	16K Spec.	Artic	Arcade	*
Spectral Invaders	16K Spec.	Bug-Byte	Arcade	8
Spec. Invasion Force	16K Spec.	Artic	Arcade	*
Spec. Microchess	16K Spec.	Artic	Traditional	*
Spec. Monitor	16K Spec.	Picturesque	Utility	8
Spec. Scramble	16K Spec.	Work Force	Arcade	7
Spec. Sound	16K Spec.	M Afzal	Utility	*
Spectres	16K Spec.	Bug-Byte	Arcade	6
Spellbin	16K Spec.	Startersoft	Education	*
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Spookyman	16K Spec.	Abbex	Arcade	7
Spreadsheet	48K Spec.	Microl	Business	7
Star Gazer	48K Spec.	CRL	Utility	8
Styx	16K Spec.	Bug-Byte	Arcade	7
Superchess II	48K Spec.	CP	Traditional	8
Supercode	16/48K Spec.	CP	Utility	*
Super Play I	16K Spec.	Video	Games	*
Superspy	48K Spec.	Shepherd	Adven.	5
Swag + Voyager	16K ZX-81	Howard	Arcade	*
Tai	16K ZX-81	PSS	Game	*
Tank Battle	16K Spec.	dK' Tronics	Game	8
Tape Breaker	16K Spec.	Spectrasoft	Utility	*
Tape Copier	16K Spec.	Lerm	Utility	*
Tasword	48K Spec.	Tasman	Business	8
Tasword II	48K Spec.	Tasman	Business	9
Taswide-64	16K Spec.	Tasman	Utility	*
Teacheraid	16K Spec.	B Farris	Education	*
Teach Data	48K Spec.	B Farris	Education	*
Teacher Data	48K Spec.	B Farris	Educational	8
Tennis	16K Spec.	Winters	Game	*
Tenpin	16K ZX-81	Phipps	Game	*
Terror from The Deep	48K Spec.	Add-on	Adven.	*
Test Match	48K Spec.	Computer Ren.	Game	*
The Orb	48K Spec.	Computer Ren.	Adven.	*
The Castle	48K Spec.	Bug Byte	Adven.	*
The Devil Rides In	16K Spec.	Carnell	Arcade	*
The Forest	48K Spec.	Phipps	Sim.	*
The Great Western	16K Spec.	New Soft	Game	*
The Great Western	16K ZX-81	New Soft	Game	*
The Pyramid	48K Spec.	Fantasy	Arcade	7
The Turk	48K Spec.	OCP	Traditional	8
3D Star Wars	48K Spec.	Add-on	Arcade	*
3D Strategy	48K Spec.	QS	Mind Game	9
Time Bandits	16K Spec.	New Soft	Adven.	*
Time Bandits	16K ZX-81	New Soft	Adven.	*
Time Gate	48K Spec.	QS	Arcade	8
Tobor	48K Spec.	Add-on	Arcade	7
Tomb of Dracula	48K Spec.	Felix	Adven.	*
Tomb of Dracula	16K ZX-81	Felix	Adven.	*
Trace	16K Spec.	Zen	Utility	*
Trace	16K Spec.	Texgate	Utility	8
Traxx	48K Spec.	QS	Arcade	7
Train Game	16K Spec.	Microsphere	Game	9
Transylvanian Tower	48K Spec.	Shepherd	Adven.	7
Traxx	48K Spec.	QS	Arcade	7
Troon	48K Spec.	Hornby	Game	8
Tube Train Terror	48K Spec.	JRS	Game	*
3D Tunnel	48K Spec.	New Gen.	Arcade	9
Use and Learn	16K Spec.	Microl	Utility	8
Valhalla	48K Spec.	Movisoft	Adven.	7
Velnor's Lair	48K Spec.	QS	Adven.	8
Voice Chess	48K Spec.	Artic	Traditional	9
Volcanic Dungeon	16K ZX-81	Carnell	Adven.	*
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Vu-Calc	16K Spec.	Sinclair	Business	7
Vu-File	16K Spec.	Sinclair	Business	8
Vu3D	48K Spec.	Sinclair	Utility	8
Warlord	48K Spec.	Lothlorian	Simulation	*
Whizz Kid	48K Spec.	C. Tutor	Educ.	*
Who Dares Wins	48K Spec.	E. Midland	Adven.	*
Wizard's Warriors	16K Spec.	Abersoft	Arcade	*
Word Fit	16K ZX-81	Ram Writer	Game	6
Word Processor	48K Spec.	Microl	Business	*
World Info	48K Spec.	Wimsoft	Utility	*
Wrath of Magra	48K Spec.	Carnell	Adven.	*
Xadom	48K Spec.	QS	Arcade	4
X Ray	16K Spec.	Zen	Utility	*
Yahtzi	48K Spec.	Work Force	Traditional	*
Yomp	16K Spec.	Virgin	Arcade	7
Zeus Assembler	48K Spec.	Sinclair	Utility	9
Ziggarat of Dread	48K Spec.	Add-on	Adven.	*
Zodiac I	16K ZX-81	Stellar	Utility	*
Zodiac II	16K ZX-81	Stellar	Utility	*
Zodiac F	48K Spec.	Stellar	Utility	7
Zuckman	16K ZX-81	DJL	Arcade	8
ZXAS	16K ZX-81	Bug Byte	Utility	*
ZX-Bug	16K ZX-81	Artic	Utility	*
ZX-Chess I	16K ZX-81	Artic	Traditional	*
ZX-Chess II	48K Spec.	Artic	Traditional	*
ZX 1K Chess	1K ZX-81	Artic	Traditional	*
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ZXDB	16K ZX-81	Bug Byte	Utility	*
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ZX Forth	48K Spec.	Artic	Language	8
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